

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
28 June 2001 (28.06.2001)

PCT

(10) International Publication Number  
**WO 01/45615 A1**

(51) International Patent Classification: **A61F 13/15**,  
A47L 13/17, A61K 7/50, B32B 3/24, 5/04, 7/02, 27/06

(74) Agents: REED, T., David et al.; The Procter & Gamble Company, 5299 Spring Grove Avenue, Cincinnati, OH 45217-1087 (US).

(21) International Application Number: PCT/US00/34745

(22) International Filing Date:  
20 December 2000 (20.12.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
(09/467,938) 21 December 1999 (21.12.1999) US  
(09/553,641) 20 April 2000 (20.04.2000) US  
(09/584,676) 31 May 2000 (31.05.2000) US

(71) Applicant: **THE PROCTER & GAMBLE COMPANY**  
[US/US]; One Procter & Gamble Plaza, Cincinnati, OH 45202 (US).

(72) Inventors: **DYE, Deborah, Ruth**; 37 Lark Avenue, Staines, Middlesex TW18 4RX (GB). **CURRO, John, Joseph**; 11604 Stablewatch Court, Cincinnati, OH 45249 (US). **BENSON, Douglas, Herrin**; 206 Jamison Road, West Harrison, IN 47060 (US). **STRUBE, John, Brian**; 4208 Jennifer Drive, Hamilton, OH 45013 (US).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU (utility model), AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, CZ (utility model), DE, DE (utility model), DK, DK (utility model), DM, DZ, EE, EE (utility model), ES, FI, FI (utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (utility model), SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

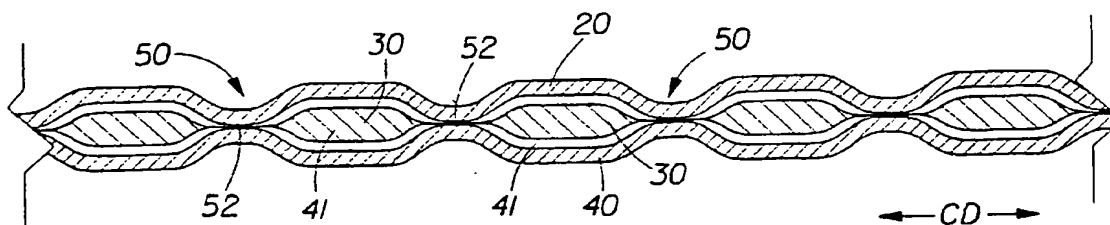
(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

— With international search report.

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: DISPOSABLE ARTICLE COMPRISING AN APERTURED LAMINATE WEB



(57) Abstract: A disposable article suitable for a number of uses is disclosed. The article comprises an apertured laminate web comprising a first extensible web having a first elongation to break, and a second extensible web joined to the first extensible web at a plurality of bond sites, the second extensible web having a second elongation to break. A third web material is disposed between the first and second nonwovens, the third web material having a third elongation to break which is less than both of the first or second elongations to break. In a further embodiment, an apertured laminate web of the article has first and second extensible webs being joined at a plurality of discrete bond sites and a third material disposed between the first and second nonwoven webs. The first and second nonwoven webs are in fluid communication via the apertures and have distinct regions being differentiated by at least one property selected from the group consisting of basis weight, fiber orientation, thickness, and density.

WO 01/45615 A1

## **DISPOSABLE ARTICLE COMPRISING AN APERTURED LAMINATE WEB**

### **CROSS REFERENCES TO RELATED APPLICATIONS**

This application is a continuation-in-part application of U. S. Serial No. 09/467,938, filed on December 21, 1999 in the names of Curro et al..

### **FIELD OF THE INVENTION**

This invention relates to a disposable article that comprises an apertured multilayer laminate web and a benefit component.

### **BACKGROUND OF THE INVENTION**

Disposable articles containing laminate webs formed by the joining of discrete webs in a layered relationship are well known for various applications. For example, laminate nonwoven webs are often utilized in disposable absorbent articles (e.g., diapers, adult incontinence products), cleansing products, polishing products, etc. Nonwovens and nonwoven laminates are also utilized to provide additional bulk or softness to a web component. Likewise, film/film laminate webs can provide benefits by combining the characteristics of various films in a layered relationship. Laminate webs can also be called composite webs.

Less common examples of laminate webs include laminates of dissimilar materials. The materials may be dissimilar in mechanical tensile properties, thermal properties, or visual/tactile properties. For example, a nonwoven web may be joined to a relatively stiff fabric to provide for a soft surface feel to the fabric. The dissimilar materials may be joined by melt bonding, adhesive bonding, ultrasonic bonding, and the like. Bonding methods are often determined by the materials themselves, but often require adhesive bonding. For example, a laminate or composite of materials having widely differing melt properties may require an adhesive layer between laminate layers. Even materials having similar melt properties, such as nonwoven and thermoplastic film materials are often joined by adhesive for adequate bonding to prevent unwanted delamination. Such processing methods can be expensive due to the addition of adhesive, and the resulting laminate is often relatively stiff, depending on the level of adhesive added.

Apertured laminate webs can be made by methods in the art. One beneficial method of aperturing a nonwoven web, for example, is disclosed in commonly-assigned U.S. Patent No. 5,916,661, issued to Benson et al. on June 29, 1999. This patent teaches a laminate material having, for example, at least one layer of a spunbonded web joined to at least one layer of a meltblown web, a bonded carded web, or other suitable material. Such apertured webs are useful as the topsheet in a disposable absorbent article. However, Benson '661 does not teach apertured laminate webs comprising completely dissimilar materials (e.g., materials of different material classes or having differing material properties).

As mentioned, nonwoven webs are beneficial as components of disposable absorbent articles, such as diapers, incontinence briefs, training pants, feminine hygiene garments, and the like, as well in personal care cleansing products like disposable wet wipes or substantially dry wipes. Nonwovens are also beneficial components of other articles such as disposable garments, surgical products (e.g., drapes, surgical gowns, etc.), durable garments, automotive components, automotive care products, upholstered furniture, filtration media, household care products (e.g., polishing wipes, dust removal wipes, etc.) and other consumer or commercial goods. Nonwovens used in these and other applications benefit from their wide range of visual and tactile properties. When used alone, however, single layer nonwovens are limited in the range of beneficial properties, including visual, tactile, strength or absorbent properties due to the limits of known methods of making, particularly as compared to woven or knitted materials.

Accordingly, it would be desirable to have a disposable article containing a laminate web having component webs of different material properties.

Additionally, it would be desirable to have a disposable article containing a laminate web formed by joining the constituent layers without adhesive.

Further, it would be desirable to have a disposable article containing an apertured laminate web having visually distinct regions giving a fabric-like or knit-like look and feel.

#### **SUMMARY OF THE INVENTION**

A disposable article comprising:

- a) a laminate web having a plurality of apertures, said laminate web comprising:
  - 1) a first extensible web having a first elongation to break;
  - 2) a second extensible web joined to said first extensible web at a plurality of bond sites, said second extensible web having a second elongation to break; and
  - 3) a third web material being disposed between said first and second webs, said third web material having a third elongation to break which is less than both of said first or second elongations to break;
- b) a benefit component disposed adjacent to said laminate web.

In another embodiment, an apertured laminate web is disclosed, having first and second extensible webs being joined at a plurality of discrete bond sites and a third material disposed between the first and second nonwoven webs. The first and second nonwoven webs are in fluid communication via the apertures and have distinct regions being differentiated by at least one property selected from the group consisting of basis weight, fiber orientation, thickness, and density.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

While the specification concludes with claims pointing out and distinctly claiming the present invention, it is believed the same will be better understood by the following drawings taken in conjunction with the accompanying specification wherein like components are given the same reference number.

FIG. 1 is a perspective of one embodiment of a laminate web of the present invention.

FIG. 2 is a cross-sectional view of a portion of the laminate web shown in Figure 1.

FIG. 3 is a magnified detail view of one bond site of a laminate web of the present invention.

FIG. 4 is a top plan view of another embodiment of the laminate web of the present invention.

FIG. 5 is a cross-sectional view of a portion of the laminate web shown in Figure 4.

FIG. 6 is a top plan view of another embodiment of the laminate web of the present invention.

FIG. 7 is a cross-sectional view of a portion of the laminate web shown in Figure 6.

FIG. 8 is a photomicrograph of one embodiment of a laminate web of the present invention.

FIG. 9 is a schematic representation of a process for making a laminate web of the present invention.

FIG. 10 is a perspective view of a melt bond calendaring apparatus.

FIG. 11 is a schematic representation of a pattern for the protuberances of the calendaring roll.

FIG. 12 is a perspective view of an apparatus for stretching a laminate of the present invention to form apertures therein.

FIG. 13 is a cross-sectional view of a portion of the mating portions of the apparatus shown in FIG. 12.

FIG. 14 is a perspective view of an alternative apparatus for stretching a laminate of the present invention in the cross-machine direction to form apertures therein.

FIG. 15 is a perspective view of another alternative apparatus for stretching a laminate of the present invention in the machine direction to form apertures therein.

FIG. 16 is a perspective representation of an apparatus for stretching a laminate of the present invention in both the cross-machine and machine directions to form apertures therein.

FIG. 17 is a perspective view of a disposable absorbent article having components that can be made of laminate web material of the present invention.

### **DETAILED DESCRIPTION OF THE INVENTION**

As used herein, the term "absorbent article" refers to devices that absorb and contain fluids (e.g., water, cleansers, conditioners, polishes, body exudates). In certain instances, the phrase refers to devices that are placed against or in proximity to the body of the wearer to absorb and contain the various exudates discharged from the body. In other instances, the phrase refers to articles that have the ability to absorb and retain the benefit component until such time when the article is utilized by a consumer for its intended purpose.

The term "disposable" is used herein to describe articles of the present invention which are not intended to be laundered or otherwise restored or extensively reused (i.e., preferably, they are intended to be discarded after 25 uses, more preferably, after about 10 uses, even more preferably, after about 5 uses, and most preferably, after about a single use). It is preferred that

such disposable articles be recycled, composted or otherwise disposed of in an environmentally compatible manner. A "unitary" disposable article refers to disposable articles that are formed of separate parts united together to form a coordinated entity so that they do not require separate manipulative parts like a separate holder and liner.

As used herein, the term "nonwoven web", refers to a web that has a structure of individual fibers or threads which are interlaid, but not in any regular, repeating manner. Nonwoven webs have been, in the past, formed by a variety of processes, such as, for example, meltblowing processes, spunbonding processes and bonded carded web processes.

As used herein, the term "microfibers" refers to small diameter fibers having an average diameter not greater than about 100 microns.

As used herein, the term "meltblown fibers" refers to fibers formed by extruding a molten thermoplastic material through a plurality of fine, usually circular, die capillaries as molten threads or filaments into a high velocity gas (e.g., air) stream which attenuates the filaments of molten thermoplastic material to reduce their diameter, which may be to a microfiber diameter. Thereafter, the meltblown fibers are carried by the high velocity gas stream and are deposited on a collecting surface to form a web of randomly dispersed meltblown fibers.

As used herein, the term "spunbonded fibers" refers to small diameter fibers that are formed by extruding a molten thermoplastic material as filaments from a plurality of fine, usually circular, capillaries of a spinneret with the diameter of the extruded filaments then being rapidly reduced by drawing.

As used herein, the term "polymer" generally includes, but is not limited to, homopolymers, copolymers, such as, for example, block, graft, random and alternating copolymers, terpolymers, etc., and blends and modifications thereof. Furthermore, unless otherwise specifically limited, the term "polymer" shall include all possible geometrical configurations of the material. These configurations include, but are not limited to, isotactic, syndiotactic and random symmetries.

As used herein, the term "elastic" refers to any material which, upon application of a biasing force, is stretchable, that is, elongatable, at least about 60 percent (i.e., to a stretched, biased length, which is at least about 160 percent of its relaxed unbiased length), and which, will recover at least 55 percent of its elongation upon release of the stretching, elongation force. A hypothetical example would be a one (1) inch sample of a material which is elongatable to at least 1.60 inches, and which, upon being elongated to 1.60 inches and released, will recover to a length of not more than 1.27 inches. Many elastic materials may be elongated by more than 60 percent (i.e., much more than 160 percent of their relaxed length), for example, elongated 100 percent or more, and many of these materials will recover to substantially their initial relaxed length, for example, to within 105 percent of their initial relaxed length, upon release of the stretch force.

As used herein, the term "nonelastic" refers to any material which does not fall within the definition of "elastic" above.

As used herein, the term "extensible" refers to any material which, upon application of a biasing force, is elongatable, at least about 50 percent without experiencing catastrophic failure.

The articles of the present invention comprise the following essential components.

#### LAMINATE WEB

The laminate web 10 of the article of the present invention comprises at least three layers, webs or plies, disposed in a layered, face-to-face relationship, as shown in FIG. 1. The layers should be sufficiently thin to be processible as described herein, but no actual thickness (i.e., caliper) is considered limiting. A first outer layer and a second outer layer 20, 40 are known, respectively, as the first extensible web having a first elongation to break and as the second extensible web having a second elongation to break. The second outer layer preferably comprises the same material as the first outer layer but may be a different material. At least one third central layer 30 is disposed between the two outer layers. The laminate web 10 is processed by thermal calendaring as described below to provide a plurality of melt bond sites 50 that serve to bond the layers 20, 30 and 40, thereby forming the constituent layers into a unitary web. While the laminate web 10 is disclosed primarily in the context of nonwoven webs and composites, in principle the laminate web 10 can be made out of any web materials that meet the requirements, (e.g., melt properties, extensibility) as disclosed herein. For example, the constituent layers can be films, micro-porous films, apertured films, and the like.

Preferably, the first and second outer layers are nonwovens. Suitable nonwoven materials for the first and second outer layers include, but are not limited to, cellulosics, sponges (i.e., both natural and synthetic), formed films, battings, and combinations thereof. Preferably, the first and second outer layers each comprise materials selected from the group consisting of cellulosic nonwovens, formed films, battings, foams, sponges, reticulated foams, vacuum-formed laminates, scrims, and combinations thereof.

The first and second layers may comprise a variety of both natural and synthetic fibers or materials. As used herein, "natural" means that the materials are derived from plants, animals, insects or byproducts of plants, animals, and insects. The conventional base starting material is usually a fibrous web comprising any of the common synthetic or natural textile-length fibers, or combinations thereof.

Nonlimiting examples of natural materials useful in the layers of the laminate web include, but are not limited to, silk fibers, keratin fibers and cellulosic fibers. Nonlimiting examples of keratin fibers include those selected from the group consisting of wool fibers, camel hair fibers, and the like. Nonlimiting examples of cellulosic fibers include those selected from the group consisting of wood pulp fibers, cotton fibers, hemp fibers, jute fibers, flax fibers, and combinations thereof. Cellulosic fiber materials are preferred in the present invention.

Nonlimiting examples of synthetic materials useful in the layers of the laminate web include those selected from the group consisting of acetate fibers, acrylic fibers, cellulose ester

fibers, modacrylic fibers, polyamide fibers, polyester fibers, polyolefin fibers, polyvinyl alcohol fibers, rayon fibers, polyethylene foam, polyurethane foam, and combinations thereof. Examples of suitable synthetic materials include acrylics such as acrilan, creslan, and the acrylonitrile-based fiber, orlon; cellulose ester fibers such as cellulose acetate, arnel, and acele; polyamides such as nylons (e.g., nylon 6, nylon 66, nylon 610, and the like); polyesters such as fortrel, kodel, and the polyethylene terephthalate fiber, polybutylene terephthalate fiber, dacron; polyolefins such as polypropylene, polyethylene; polyvinyl acetate fibers; polyurethane foams and combinations thereof. These and other suitable fibers and the nonwovens prepared therefrom are generally described in Riedel, "Nonwoven Bonding Methods and Materials," Nonwoven World (1987); The Encyclopedia Americana, vol. 11, pp. 147-153, and vol. 26, pp. 566-581 (1984); U. S. Patent No. 4,891,227, to Thaman et al., issued January 2, 1990; and U. S. Patent No. 4,891,228, each of which is incorporated by reference herein in its entirety.

Nonwovens made from natural materials consist of webs or sheets most commonly formed on a fine wire screen from a liquid suspension of the fibers. See C.A. Hampel et al., The Encyclopedia of Chemistry, third edition, 1973, pp. 793-795 (1973); The Encyclopedia Americana, vol. 21, pp. 376-383 (1984); and G.A. Smook, Handbook of Pulp and Paper Technologies, Technical Association for the Pulp and Paper Industry (1986); which are incorporated by reference herein in their entirety.

Natural material nonwovens useful in the laminate web of present invention may be obtained from a wide variety of commercial sources. Nonlimiting examples of suitable commercially available paper layers useful herein include Airtex®, an embossed airlaid cellulosic layer having a base weight of about 71 gsy, available from James River, Green Bay, WI; and Walkisoft®, an embossed airlaid cellulosic having a base weight of about 75 gsy, available from Walkisoft U.S.A., Mount Holly, NC.

Additional suitable nonwoven materials include, but are not limited to, those disclosed in U. S. Patent Nos. 4,447,294, issued to Osborn on May 8, 1984; 4,603,176 issued to Bjorkquist on July 29, 1986; 4,981,557 issued to Bjorkquist on January 1, 1991; 5,085,736 issued to Bjorkquist on February 4, 1992; 5,138,002 issued to Bjorkquist on August 8, 1992; 5,262,007 issued to Phan et al. on November 16, 1993; 5,264,082, issued to Phan et al. on November 23, 1993; 4,637,859 issued to Trokhan on January 20, 1987; 4,529,480 issued to Trokhan on July 16, 1985; 4,687,153 issued to McNeil on August 18, 1987; 5,223,096 issued to Phan et al. on June 29, 1993 and 5,679,222, issued to Rasch et al. on October 21, 1997; 5,628,097 issued to Benson et al. on May 13, 1997; 5,916,661 and 5,658,639, both issued to Benson et al. on June 29, 1999; each of which is incorporated by reference herein in its entirety.

Methods of making nonwovens are well known in the art. Generally, these nonwovens can be made by air-laying, water-laying, meltblowing, coforming, spunbonding, or carding processes in which the fibers or filaments are first cut to desired lengths from long strands, passed into a water or air stream, and then deposited onto a screen through which the fiber-laden air or water is passed. The resulting layer, regardless of its method of production or

composition, is then subjected to at least one of several types of bonding operations to anchor the individual fibers together to form a self-sustaining web. In the present invention the layers that comprise nonwovens can be prepared by a variety of processes including, but not limited to, air-entanglement, hydroentanglement, thermal bonding, and combinations of these processes.

The less extensible third central layer may also be a nonwoven as described above. Yet, the central layer 30 itself need not be thermally compatible with the outer layers. The central layer 30 need not even be melt processible. It can be, for example, a cellulosic material, such as paper, tissue, paper towel, paper napkins; a metallic material, such as a metallic foil; a woven or knit material, such as cotton or rayon blends; or a thermoset material, such as a polyester or aromatic polyamide film. The central layer 30 can be another nonwoven having suitable properties for processing into an apertured layer. If central layer 30 has a melting point, it is preferably at least about 20°C higher than the outer layers. The central layer 30, however, need not have a melting point, and may simply experience softening at the calendaring temperatures required to bond the laminate. In certain central layer materials, such as metallic foils, there is not even any softening due to thermal processing of the web.

One of the unexpected advantages of the present invention is the discovery that novel web properties can be exhibited by the choice of central layer 30 disposed between the two outer layers. Preferably, the central layer material is selected from the group consisting of cellulose, thermoplastic battings, metallic foils, metallic battings, sponges, formed films, and combinations thereof. Suitable materials for the central layer may include those discussed above. It is important, however, that the central layer have a third elongation break that is less than both the first and second outer layers. The wide range of possible central layer materials permits a surprising variety of structures of the present invention, each having beneficial application in a wide assortment of end uses. For example, when outer layers of nonwoven material are used with a central layer of metallic foil, the resulting laminate is a flexible, soft, formable, metallic web that is relatively silent when folded, crumpled or otherwise deformed. Such a material can be used in applications requiring electrical shielding, for example. When a central layer of tissue paper is used, the resulting laminate is a soft, bulky, absorbent web. Such a laminate is suitable for use as a wiping implement, for example. Further, since the laminate web 10 is formed without the use of thermoplastic adhesives, durable, garment-like properties can be obtained. Such laminates can be laundered a number of times before suffering unacceptable wear.

As shown in FIG. 2, central layer 30 is chosen such that when the constituent web layers of laminate web 10 are processed as detailed below, portions of central layer 30 in the region of the melt bond sites 50 separate to permit the first layer 20 to melt bond directly to the second outer layer 40 at the interface of the two materials 52 at melt bond sites 50. Without being bound by theory, it is believed that the process of the present invention facilitates such separation of central layer 30 by shearing, cutting, or otherwise fracturing the central layer, and displacing the material of the central layer sufficiently to permit thermal bonding of the two

outer layers. Thus, central layer 30 should be chosen to have properties that permit such cutting through, such as relatively low extensibility, relatively high frangibility, or relatively high deformability, such that the material of central layer 30 can be "squeezed" out of the region of thermal bond sites 50.

Without being bound by theory, it is believed that to accomplish the bonding of the layers of the laminate web to subsequently form apertures therein, the thermal point calendaring described below should form thermal bond sites having a narrow width  $W$  dimension and a high aspect ratio. For example, FIG. 3 shows the melt area of a single melt bond site 50 having a narrow width dimension  $W$  and a high aspect ratio, i.e., the length,  $L$ , is much greater than the width,  $W$ . The length  $L$  should be selected to permit adequate bond area while width  $W$  is sufficiently narrow such that the protuberance used to form the bond site (as described below) can cut, shear, or otherwise pierce the layers 30 at the region of the bond sites by the method described below. Width  $W$  can be between about 0.003 inches and 0.020 inches, but in a preferred embodiment, is between about 0.005 inches and 0.010 inches, and may be adjusted depending on the properties of central layer 30. In a preferred embodiment, only layer(s) 30 is/are pierced, such that the central layer(s) is/are apertured after bonding, while the outer layers are in a bonded, unapertured condition. It may, however, be desirable for some end use requirements that the protuberances used to form the bond sites cut, shear, pierce or otherwise form an opening through all the layers, 20, 30, 40 at some or all of the bond sites.

It is believed that the aspect ratio can be as low as about 3 (i.e., ratio of  $L/W$  equals 3/1). It can also be between about 4 and 20. In one preferred embodiment, the aspect ratio was about 10. The aspect ratio of the melt bond sites 50 is limited only by the corresponding aspect ratio of the point bonding protuberances of the calendaring roller(s), as detailed below.

In a preferred embodiment, the longitudinal axis of each bond site,  $l$ , which corresponds directionally to the length dimension of bond site 50, is disposed in a regular, repeating pattern oriented generally in the machine direction,  $MD$  as shown in FIG. 1. But the bond sites may be disposed in a regular, repeating pattern oriented in the cross machine direction, or randomly oriented in a mixture of cross and machine directions. For example, the bond sites 50 can be disposed in a "herringbone" pattern.

Another benefit of the present invention is obtained when the thermally bonded laminate web described above is stretched or extended in a direction generally orthogonal to the longitudinal axis,  $l$ , of melt bond sites 50. The melt bonding at the melt bond sites 50 tends to make localized weakened portions of the web at the bond sites. Thus, as portions of the web 10 are extended in a direction generally orthogonal to the longitudinal axis  $l$  of bond sites 50, the material at the bond site fails in tension and an aperture is formed. The relatively high aspect ratio of melt bond sites 50, permits a relatively large aperture to be formed upon sufficient extension. When the laminate web 10 is uniformly tensioned, the result is a regular pattern of a plurality of apertures 60 corresponding to the pattern of melt bond sites 50.

FIG. 4 shows a partially cut-away representation of an apertured laminate web useful for the present invention. As shown, the partial cut-away permits each layer or ply to be viewed in a plan view. The laminate web 10 shown in FIG. 4 is produced after the thermally bonded laminate is stretched in a direction orthogonal to the longitudinal axis of the melt bond sites, in this case, in the cross-machine direction, CD. As shown, where formerly were melt bond sites 50, apertures 60 are produced as the relatively weak bond sites fail in tension. Also as shown, central layer 30 can remain generally uniformly distributed within laminate 10, depending on the material properties of central layer 30.

When apertures 60 are formed, the thermally bonded portions of layers 20, 30, 40 remain primarily on the portions of the aperture perimeters corresponding to the length dimension of bond sites 50. Therefore, each aperture 60 does not have a perimeter of thermally bonded material, but only portions remain bonded, represented as 62 in FIG. 4. One beneficial property of such a laminate web is that once apertured, fluid communication with the central layer is facilitated. Thus, an absorbent central layer 30 can be used between two relatively non-absorbent outer layers, and the laminate 10 could be an absorptive wiper with a relatively dry to the touch outer surface.

FIG. 5 is a schematic representation of the cross-section denoted in FIG. 4. As shown, apertures 60 form when the laminate web is elongated in the direction T.

In certain preferred embodiments, the laminate web is characterized by having from about 10% to about 20% of the surface area be "open area." As used herein, "open area" means that the web is apertured or hole-containing such that the amount of material necessary to cover a certain area is minimized due expansion of the web that takes place after stretching/ring rolling. More preferably, the open area of the web is from about 11% to about 17%.

Another benefit of the articles of the present invention that is derived when the laminate web is extended as described with reference to FIG. 4, is that the central layer 30 that has an elongation to break less than either of the two outer layers fails in tension at a lower extensibility than does either of the outer layers. Thus, when the laminate is extended generally orthogonal to the longitudinal axis, L, of melt bond sites 50, outer layers 20 and 40 extend to form apertures. However, central layer 30, which has an elongation to break less than that of the outer layers, fractures upon sufficient extension, such that after extension central layer 30 is no longer uniformly distributed over the non-apertured regions of the laminate web 10.

An example of one embodiment of a web having a central layer having an elongation to break less than either of the two outer layers is shown partially cut-away in FIG. 5. The partial cut-away permits each layer or ply to be viewed in a plan view. As shown, after extension, central layer 30 becomes fragmented, forming discontinuous regions of the central layer material. These discontinuous regions may be relatively uniformly distributed, such as in rows as shown in FIG. 5, or may be relatively randomly distributed, depending on the pattern of melt bond sites 50 and the method of extension employed. One example of a web 10 having a

structure similar to that shown in FIG. 5 is a web having outer layers of relatively extensible nonwovens, with a central layer of relatively low extensibility tissue paper.

A surprising benefit of the laminate web structure described in FIG. 6 is the presence of distinct regions in the non-apertured portion of the web being differentiated by at least one property selected from the group consisting of basis weight, thickness, density, and combinations thereof. As shown in the cross-section of FIG. 7, several such regions can be differentiated. In a preferred embodiment, the regions are visually distinct, giving the laminate web an aesthetically pleasing look and feel that is particularly useful in the articles of the present invention. The regions may also give the laminate a garment-like or knit-like texture.

With reference to FIG. 7, several structurally distinct regions can be identified in the cross-section shown. The region denoted 64 corresponds to the aperture 60. In the non-apertured area of the web, a region 66 is a relatively high basis weight region comprising central layer 30. Region 68 represents the portion of the laminate web in which central layer 30 has fractured and separated, *i.e.*, is no longer fully present, forming a relatively low basis weight region of web 10. In general, the higher basis weight regions will also be correspondingly higher density regions, but need not be so. For example, a post-extension embossing process can be applied to web 10 to form regions of multiple densities in addition to the regions of multiple basis weight. For either the high basis weight regions or the high density regions, often the differences can be discernible by simply rubbing between the fingers.

In general, for a laminate web 10 having generally parallel rows of melt bond sites 50 extending in the machine direction **MD**, which correspondingly form generally parallel rows of apertures when extended, and having a central layer with a lower elongation to break than the outer layers, the resulting extended, apertured laminate web 10 is characterized by generally low basis weight, low density regions between the apertures in the machine direction, **MD**, *e.g.*, region 68 in FIGs. 6 and 7. Likewise, the laminate web 10 is characterized by relatively high basis weight, high density regions between adjacent rows of apertures in the cross-machine direction, **CD**, *e.g.*, region 66 in FIG. 7. By choice of central layer material 30 and possibly post laminating operations, *e.g.*, an embossing process, the thickness of the laminate web can likewise be varied, the thicker regions generally corresponding to the higher density regions.

Another embodiment of a laminate web useful for the present invention utilizes nonwoven webs as the outer layers is characterized by distinct regions differentiated by fiber orientation. Differential fiber orientation can be achieved by providing for localized regions within the web that experience greater extension than other regions. For example, by locally straining the web 10 to a greater degree in the regions corresponding to regions 68 in FIG. 6, regions of significant fiber reorientation are formed. Such localized straining is possible by the method of the present invention detailed below.

FIG. 8 is a photomicrograph showing in magnified detail a web of the present invention which has been extended to form apertures, and locally extended to produce regions 68 of fiber reorientation. As can be seen in FIG. 8, by locally extending portions of the web to a greater

extent than others, the apertures formed thereby can be of different sizes. Thus, the region denoted generally as 70 in FIG. 8 has undergone more strain (i.e., local extension) than the region denoted by 72. Thus, the apertures in region 70 are larger than those in region 72, and the basis weight of the nonwoven web material in region 72 is less than the basis weight of the nonwoven web in region 70. In addition to the difference in basis weight due to localized strain differentials, the laminate web of the present invention can also exhibit distinct regions 68 of fiber reorientation. In these regions, the fibers have been reoriented from a generally random orientation to a predominant orientation in the direction of extension.

To make a web 10 as shown in FIG. 6, central layer 30 can be any of a great number of dissimilar materials. For example, if outer layers 20 and 40 are nonwoven webs having a relatively high elongation to break, central layer 30 can be paper, tissue paper, thermoplastic film, metal foil, closed or open cell foam, or any other material that has a relatively low elongation to break compared to the two outer layers. The outer layer materials may themselves be dissimilar, with the only constraint being that the central layer be relatively less extensible in the direction of extension to form apertures.

Additionally, more than one central layer 30 can be used with beneficial results. For example, a laminate web comprising a cellulosic tissue central layer and an additional central layer comprising a polymeric film wherein both central layers are disposed between nonwoven first and second outer layers can produce an absorptive wiping article with one side being relatively more absorptive than the other. If the additional polymeric film central layer is a three-dimensional formed film, the film side can provide added texture to the laminate that is beneficial in many wiping applications. Macroscopically-expanded, three-dimensional formed films suitable for use in the present invention include those described in commonly-assigned U.S. Pat. No. 3,929,135 issued to Thompson on December 30, 1975, and U.S. Pat. No. 4,342,314 issued to Radel et al. on August 3, 1982, both patents hereby incorporated herein by reference.

The (or "a") central layer can also be elastomeric, and can be an elastomeric macroscopically-expanded, vacuum-formed, three-dimensional formed film, such as described in commonly-assigned U.S. Ser. No. 08/816,106, entitled "Tear Resistant Porous Extensible Web" filed by Curro et al. on March 14, 1997, and hereby incorporated herein by reference. Further, the (or "a") central layer can be a three-dimensional formed film having micro-apertures such as described in commonly-assigned U.S. Pat. No. 4,629,643 issued to Curro et al. on December 16, 1986, and 4,609,518, issued to Curro et al. on September 2, 1986, both of which are hereby incorporated herein by reference.

The (or "a") central layer can be a web material having a strainable network as disclosed in U.S. Pat. No. 5,518,801 issued to Chappell et al. on May 21, 1996, and hereby incorporated herein by reference. Such a web can be a structural elastic-like film (SELF) web, formed by, for example, embossing by mating plates or rolls.

The (or "a") central layer can be an absorbent open cell foam web material. Particularly suitable absorbent foams for high performance absorbent articles such as diapers have been

made from High Internal Phase Emulsions (hereafter referred to as "HIPE"). See, for example, U.S. Patent 5,260,345 (DesMarais et al), issued November 9, 1993 and U.S. Patent 5,268,224 (DesMarais et al), issued December 7, 1993, hereby incorporated herein by reference. These absorbent HIPE foams provide desirable fluid handling properties, including: (a) relatively good wicking and fluid distribution characteristics to transport the imbibed urine or other body fluid away from the initial impingement zone and into other regions of the foam structure to allow for subsequent gushes of fluid to be accommodated; and (b) a relatively high storage capacity with a relatively high fluid capacity under load, i.e. under compressive forces.

The central layer 30 may further comprise absorbent gelling materials. For example, supersorbers or hydrogel materials may provide for superior absorbency when the laminate web of the present invention is used as an absorbent wipe or a core in a disposable absorbent article of the present invention. By "hydrogel" as used herein is meant an inorganic or organic compound capable of absorbing aqueous fluids and retaining them under moderate pressures. For good results the hydrogels should be water insoluble. Examples are inorganic materials such as silica gels and organic compounds such as cross-linked polymers. Cross-linking may be by covalent, ionic, van der Waals, or hydrogen bonding. Examples of polymers include polyacrylamides, polyvinyl alcohol, ethylene maleic anhydride copolymers, polyvinyl ethers, hydroxypropyl cellulose, carboxymethyl cellulose, polyvinyl pyridine and the like. Suitable gelling materials are described below in the "optional ingredients" that relates to the personal care articles of the present invention. It should be understood, however, that such gelling materials may also be utilized in each of the articles of the present invention, irrespective of the intended use of the article.

The structure of the laminate web is particularly useful in the assembly of the articles of the present invention since the web can be made of dissimilar materials without the use of adhesive for joining. The plurality of melt bond sites 50 are sufficient to keep the component webs together in the laminate web, so that the laminate web behaves as a unitary web for processing integrity and use, without unwanted delamination. However, in some embodiments, and for certain materials, it may be beneficial to apply adhesive between at least two of the constituent layers.

#### Method of Making The Laminate Web

Referring to FIG. 9 there is schematically illustrated at 100 a process for making a laminate web of the present articles.

A first relatively extensible web 120 is unwound from a supply roll 104 and travels in a direction indicated by the arrows associated therewith as the supply roll 104 rotates in the direction indicated by the arrows associated therewith. Likewise a second relatively extensible web 140 is unwound from supply roll 105. A central layer 130 is likewise drawn from supply roll 107. The three components (or more, if more than one central layer is used) pass through a nip 106 of the thermal point bond roller arrangement 108 formed by rollers 110 and 112.

Either outer layer can comprise a formed film, such as a three-dimensional formed film having micro-apertures such as described in commonly-assigned U.S. Pat. No. 4,629,643 issued to Curro et al. on December 16, 1986, and 4,609,518, issued to Curro et al. on September 2, 1986, both of which are hereby incorporated herein by reference.

In a preferred embodiment, both outer layers comprise nonwoven materials, and may be the identical. The nonwoven material may be formed by known nonwoven extrusion processes, such as, for example, known meltblowing processes or known spunbonding processes, and passed directly through the nip 106 without first being bonded and/or stored on a supply roll. However, in a preferred embodiment, the nonwoven webs are themselves thermally point bonded (consolidated) webs commercially available on supply rolls.

The nonwoven web outer layer(s) may be elastic or nonelastic so long as the third central layer is less extensible than both the first and second outer layers. The nonwoven web may be any melt-fusible web, including a spunbonded web, a meltblown web, or a bonded carded web. If the nonwoven web is a web of meltblown fibers, it may include meltblown microfibers. The nonwoven web may be made of fiber forming polymers such as, for example, polyolefins. Exemplary polyolefins include one or more of polypropylene, polyethylene, ethylene copolymers, propylene copolymers, and butene copolymers. The nonwoven web can have a basis weight between about 10 to about 60 grams per square meter (gsm), and more preferably about 15 to about 30 gsm.

The nonwoven outer layers may themselves each be a multilayer material having, for example, at least one layer of a spunbonded web joined to at least one layer of a meltblown web, a bonded carded web, or other suitable material. For example, the nonwoven web may be a multilayer web having a first layer of spunbonded polypropylene having a basis weight from about 0.2 to about 8 ounces per square yard, a layer of meltblown polypropylene having a basis weight from about 0.2 to about 4 ounces per square yard, and a second layer of spunbonded polypropylene having a basis weight from about 0.2 to about 8 ounces per square yard. Alternatively, the nonwoven web may be a single layer of material, such as, for example, a spunbonded web having a basis weight from about 0.2 to about 10 ounces per square yard or a meltblown web having a basis weight from about 0.2 to about 8 ounces per square yard.

The nonwoven web outer layers may also be a composite made up of a mixture of two or more different fibers or a mixture of fibers and particles. Such mixtures may be formed by adding fibers and/or particulates to the gas stream in which the meltblown fibers or spunbond fibers are carried so that an intimate entangled co-mingling of fibers and other materials, e.g., wood pulp, staple fibers and particles occurs prior to collection of the fibers.

Prior to processing the laminate web as described herein, the outer cover of the fibers of the respective layers can be joined by bonding to form a coherent web structure. Suitable bonding techniques include, but are not limited to, chemical bonding, ultrasonic bonding, thermobonding, such as point calendering, hydroentangling, and needling.

Referring to FIGs. 9 and 10, the nonwoven thermal bond roller arrangement **108** preferably comprises a patterned calendar roller **110** and a smooth anvil roller **112**. One or both of the patterned calendar roller **110** and the smooth anvil roller **112** may be heated and the pressure between the two rollers may be adjusted by well known means to provide the desired temperature, if any, and pressure to concurrently displace central layer **30** at melt bond sites, and melt bond the two outer layers together at a plurality of bond sites.

The patterned calendar roller **110** is configured to have a circular cylindrical surface **114**, and a plurality of protuberances or pattern elements **116** which extend outwardly from surface **114**. The protuberances **116** are disposed in a predetermined pattern with each protuberance **116** being configured and disposed to displace central layer **30** at melt bond sites, and melt bond the two outer layers together at a plurality of locations. One pattern of protuberances is shown in FIG. 11. As shown, the protuberances **116** have a relatively small width, **WP**, which can be between about 0.003 inches and 0.020 inches, but in a preferred embodiment is about 0.010 inches. Protuberances can have a length, **LP**, of between about 0.030 inches and about 0.200 inches, and in a preferred embodiment has a length of about 0.100 inches. In a preferred embodiment, the protuberances have an aspect ratio of 10. The pattern shown is a regular repeating pattern of staggered protuberances, generally in rows, each separated by a row spacing, **RS**, of about between about 0.010 inches and about 0.200 inches. In a preferred embodiment, row spacing **RS** is about 0.060 inches. The protuberances can be spaced apart within a row by a protuberance spacing, **PS** generally equal to the protuberance length, **LP**. But the spacing and pattern can be varied in any way depending on the end product desired.

As shown in FIG. 10, patterned calendar roller **110** can have a repeating pattern of protuberances **116** which extend about the entire circumference of surface **114**. Alternatively, the protuberances **116** may extend around a portion, or portions of the circumference of surface **114**. Likewise, the protuberances **116** may be in a non-repeating pattern, or in a repeating pattern of randomly oriented protuberances.

The protuberances **116** are preferably truncated conical shapes which extend radially outward from surface **114** and which have rectangular or somewhat elliptical distal end surfaces **117**. Although it is not intended to thereby limit the scope of the present invention to protuberances of only this configuration, it is currently believed that the high aspect ratio of the melt bond site **50** is only achievable if the protuberances likewise have a narrow width and a high aspect ratio at the distal end surfaces **117**, as shown above with reference to FIG. 11. Without being bound by theory, it is believed that other suitable shapes for distal ends **117** may include, but are not limited to circular, square, rectangular, etc., if they facilitate the bonding and aperturing of the laminate web. The roller **110** is preferably finished so that all of the end surfaces **117** lie in an imaginary right circular cylinder which is coaxial with respect to the axis of rotation of roller **110**.

The height of the protuberances should be selected according to the thickness of the laminate being bonded. In general, the height dimension should be greater than the maximum thickness of the laminate web during the calendaring process, so that adequate bonding occurs at the bond sites, and only at the bond sites.

Anvil roller 112, is preferably a smooth surfaced, right circular cylinder of steel.

After passing through nip 106, the three (or more) component webs 120, 130, and 140 have been formed into laminate web 10. At this point in the process the outer layers are thermally bonded and unapertured, as shown in FIGs. 1 and 2. Central layer(s) 30, from web 130, is apertured, having been displaced by protuberances 116 in nip 106.

The laminate web 10 may be further processed to form apertures in the whole laminate web extending portions of the web in a direction orthogonal to the axis I of bond sites 50. It is by this process that the open area of the web is formed. As shown in FIGs. 9 and 10, the axis I is generally parallel to the machine direction MD of the web being processed. Therefore, extension in the cross-direction CD at the bonded portions causes the bond sites 50 to rupture and open to form apertures in the web.

One method for forming apertures across the web is to pass the web through nip 130 formed by an incremental stretching system 132 employing opposed pressure applicators 134 and 136 having three-dimensional surfaces which at least to a degree are complementary to one another. Stretching of the laminate web may be accomplished by other methods known in the art, including tentoring, or even by hand. However, to achieve even strain levels across the web, and especially if localized strain differentials are desired, the incremental stretching system disclosed herein is preferred.

Referring now to FIG. 12, there is shown a fragmentary enlarged view of the incremental stretching system 132 comprising incremental stretching rollers 134 and 136. The incremental stretching roller 134 includes a plurality of teeth 160 and corresponding grooves 161 which extend about the entire circumference of roller 134. Incremental stretching roller 136 includes a plurality of teeth 162 and a plurality of corresponding grooves 163. The teeth 160 on roller 134 intermesh with or engage the grooves 163 on roller 136, while the teeth 162 on roller 136 intermesh with or engage the grooves 161 on roller 134. The teeth of each roller are generally triangular-shaped, as shown in FIG. 13. The apex of the teeth may be slightly rounded, if desired for certain effects in the finished web.

With reference to FIG. 13, which shows a portion of the intermeshing of the teeth 160 and 162 of rollers 134 and 136, respectively. The term "pitch" as used herein, refers to the distance between the apexes of adjacent teeth. The pitch can be between about 0.02 to about 0.30 inches, and is preferably between about 0.05 and about 0.15 inches. The height (or depth) of the teeth is measured from the base of the tooth to the apex of the tooth, and is preferably equal for all teeth. The height of the teeth can be between about 0.10 inches and 0.90 inches, and is preferably about 0.25 inches and 0.50 inches.

The teeth **160** in one roll can be offset by one-half the pitch from the teeth **162** in the other roll, such that the teeth of one roll (e.g., teeth **160**) mesh in the valley (e.g., valley **163**) between teeth in the mating roll. The offset permits intermeshing of the two rollers when the rollers are "engaged" or in an intermeshing, operative position relative to one another. In a preferred embodiment, the teeth of the respective rollers are only partially intermeshing. The degree to which the teeth on the opposing rolls intermesh is referred to herein as the "depth of engagement" or "DOE" of the teeth. As shown in FIG. 13, the DOE, **E**, is the distance between a position designated by plane **P1** where the apexes of the teeth on the respective rolls are in the same plane (0% engagement) to a position designated by plane **P2** where the apexes of the teeth of one roll extend inward beyond the plane **P1** toward the valley on the opposing roll. The optimum or effective DOE for particular laminate webs is dependent upon the height and the pitch of the teeth and the materials of the web.

In other embodiments the teeth of the mating rolls need not be aligned with the valleys of the opposing rolls. That is, the teeth may be out of phase with the valleys to some degree, ranging from slightly offset to greatly offset.

As the laminate web **10** having melt bonded locations **50** passes through the incremental stretching system **132** the laminate web **10** can be subjected to tensioning in the **CD** or cross-machine direction causing the laminate web **10** to be extended in the **CD** direction. Alternatively, or additionally the laminate web **10** may be tensioned in the **MD** (machine direction). The tensioning force placed on the laminate web **10** can be adjusted (e.g., by adjusting DOE) such that it causes the melt bonded locations **50** to separate or rupture creating a plurality of apertures **60** coincident with the melt bonded locations **50** in the laminate web **10**. However, portions of the melt bonds of the laminate web **10** remain, as indicated by portions **62** in FIG. 4, thereby maintaining the nonwoven web in a coherent condition even after the melt bonded locations rupture.

After being subjected to the tensioning force applied by the incremental stretching system **132**, the laminate web **10** includes a plurality of apertures **60** which are coincident with the melt bonded regions **50** of the laminate web. As mentioned, a portion of the circumferential edges of apertures **60** include remnants **62** of the melt bonded locations **60**. It is believed that the remnants **60** help to resist further tearing or delamination of the laminate web.

Instead of two substantially identical rolls **134** and **136**, one or both rolls can be modified to produce extension and additional patterning. For example, one or both rolls can be modified to have cut into the teeth several evenly-spaced thin planar channels **246** on the surface of the roll, as shown on roll **236** in FIG. 14. In FIG. 14 there is shown an enlarged view of an alternative incremental stretching system **232** comprising incremental stretching rollers **234** and **236**. The incremental stretching roller **234** includes a plurality of teeth **260** and corresponding grooves **261** which extend about the entire circumference of roller **234**. Incremental stretching roller **236** includes a plurality of teeth **262** and a plurality of corresponding grooves **263**. The teeth **260** on roller **234** intermesh with or engage the grooves **263** on roller **236**, while the teeth

262 on roller 236 intermesh with or engage the grooves 261 on roller 234. The teeth on one or both rollers can have channels 246 formed, such as by machining, such that regions of undeformed laminate web material may remain after stretching. A suitable pattern roll is described in U.S. Patent No. 5,518,801, issued May 21, 1996, in the name of Chappell, et al., the disclosure of which is incorporated herein by reference.

Likewise, the incremental stretching can be by mating rolls oriented as shown in FIG. 15. Such rolls comprise a series of ridges 360, 362, and valleys, 361, 363 that run parallel to the axis, A, of the roll, either 334 or 336, respectively. The ridges form a plurality of triangular-shaped teeth on the surface of the roll. Either or both rolls may also have a series of spaced-apart channels 346 that are oriented around the circumference of the cylindrical roll. Rolls as shown are effective in incrementally stretching a laminate having bond sites 50 having the axis I oriented generally parallel to the cross-machine (CD) direction of the web as its being processed.

In one embodiment, the method of the making the laminate web of the articles of the present invention can comprise both CD and MD incremental stretching. As shown in FIG. 16, two pairs of incremental stretching rolls can be used in line, such that one pair (232, which, as shown in FIG. 16 includes a series of spaced-apart channels 246) performs CD stretching, and another pair, 332 performs MD stretching. By this method many interesting fabric-like textures can be made to be incorporated into the articles of the present invention. The resulting hand and visual appearance make such fabric-like webs ideal for use in the articles of the present invention.

#### BENEFIT COMPONENT

The articles of the present invention further comprise a benefit component that is disposed adjacent to the laminate web. Since the articles of the present invention are suitable for use in a number of areas, e.g. personal care, household care, etc., the benefit component may be selected from the group consisting of cleansing components, conditioning components, cosmetic components, cleaning components, polishing/dusting components, and combinations thereof.

#### Cleansing Component

A suitable benefit component that is a cleansing component preferably comprises one or more surfactants. The cleansing component is disposed adjacent to the laminate web. In certain embodiments, the cleansing component is impregnated into the plies of the laminate web. In other embodiments, the cleansing component is deposited onto one or more surfaces of the layers/plies of the laminate web. The articles of the present invention comprise from about 10% to about 1,000%, preferably from about 50% to about 600%, and more preferably from about 100% to about 250%, based on the weight of the laminate web, of the surfactant. Also, the articles of the present invention preferably comprise at least about 1 gram, by weight of the laminate web, of a surfactant. Thus, the cleansing component may be added to the web without requiring a drying process.

The surfactants of the cleansing component are preferably lathering surfactants. As used herein, "lathering surfactant" means a surfactant, which when combined with water and mechanically agitated generates a foam or lather. Such surfactants are preferred since increased lather is important to consumers as an indication of cleansing effectiveness. In certain personal care embodiments, the surfactants or combinations of surfactants are preferably mild. As used herein, "mild" means that the surfactants as well as to the articles of the present invention demonstrate skin mildness at least milder than common bar soap matrices that typically comprise a combination of natural soap and synthetic surfactant (e.g., Lever 2000® and Zest®). Methods for measuring mildness, or inversely the irritancy, of surfactant containing articles, are based on a skin barrier destruction test. In this test, the milder the surfactant, the lesser the skin barrier is destroyed. Skin barrier destruction is measured by the relative amount of radio-labeled (tritium labeled) water ( $^3\text{H-H}_2\text{O}$ ) which passes from the test solution through the skin epidermis into the physiological buffer contained in the diffusate chamber. This test is described by T. J. Franz in the *J. Invest. Dermatol.*, 1975, 64, pp. 190-195; and in U. S. Patent No. 4,673,525, to Small et al., issued June 16, 1987, which are both incorporated by reference herein in their entirety. Other testing methodologies for determining surfactant mildness well known to one skilled in the art can also be used.

A wide variety of lathering surfactants are useful herein and include those selected from the group consisting of anionic lathering surfactants, nonionic lathering surfactants, cationic lathering surfactants, amphoteric lathering surfactants, and mixtures thereof.

#### Anionic Lathering Surfactants

Nonlimiting examples of anionic lathering surfactants useful in the cleansing component of the article are disclosed in McCutcheon's, Detergents and Emulsifiers, North American edition (1986), published by Allured Publishing Corporation; McCutcheon's, Functional Materials, North American Edition (1992); and U. S. Patent No. 3,929,678, to Laughlin et al., issued December 30, 1975, each of which is incorporated by reference herein in their entirety.

A wide variety of anionic surfactants are potentially useful herein. Nonlimiting examples of anionic lathering surfactants include those selected from the group consisting of alkyl and alkyl ether sulfates, sulfated monoglycerides, sulfonated olefins, alkyl aryl sulfonates, primary or secondary alkane sulfonates, alkyl sulfosuccinates, acyl taurates, acyl isethionates, alkyl glycerylether sulfonate, sulfonated methyl esters, sulfonated fatty acids, alkyl phosphates, ethoxylated alkyl phosphates, acyl glutamates, acyl sarcosinates, alkyl sulfoacetates, acylated peptides, alkyl ether carboxylates, acyl lactylates, anionic fluorosurfactants, and combinations thereof. Combinations of anionic surfactants can be used effectively in the present invention.

Anionic surfactants for use in the cleansing component include alkyl and alkyl ether sulfates. These materials have the respective formulae  $\text{R1O-SO}_3\text{M}$  and  $\text{R1}(\text{CH}_2\text{H}_4\text{O})_x\text{-O-SO}_3\text{M}$ , wherein R1 is a saturated or unsaturated, branched or unbranched alkyl group from about 8 to about 24 carbon atoms, x is 1 to 10, and M is a water-soluble cation such as

ammonium, sodium, potassium, magnesium, triethanolamine, diethanolamine and monoethanolamine. The alkyl sulfates are typically made by the sulfation of monohydric alcohols (having from about 8 to about 24 carbon atoms) using sulfur trioxide or other known sulfation technique. The alkyl ether sulfates are typically made as condensation products of ethylene oxide and monohydric alcohols (having from about 8 to about 24 carbon atoms) and then sulfated. These alcohols can be derived from fats, e.g., coconut oil or tallow, or can be synthetic. Specific examples of alkyl sulfates which may be used in the cleansing component are sodium, ammonium, potassium, magnesium, or TEA salts of lauryl or myristyl sulfate. Examples of alkyl ether sulfates which may be used include ammonium, sodium, magnesium, or TEA laureth-3 sulfate.

Another suitable class of anionic surfactants are the sulfated monoglycerides of the form  $R_1CO-O-CH_2-C(OH)H-CH_2-O-SO_3M$ , wherein  $R_1$  is a saturated or unsaturated, branched or unbranched alkyl group from about 8 to about 24 carbon atoms, and  $M$  is a water-soluble cation such as ammonium, sodium, potassium, magnesium, triethanolamine, diethanolamine and monoethanolamine. These are typically made by the reaction of glycerin with fatty acids (having from about 8 to about 24 carbon atoms) to form a monoglyceride and the subsequent sulfation of this monoglyceride with sulfur trioxide. An example of a sulfated monoglyceride is sodium cocomonoglyceride sulfate.

Other suitable anionic surfactants include olefin sulfonates of the form  $R_1SO_3M$ , wherein  $R_1$  is a mono-olefin having from about 12 to about 24 carbon atoms, and  $M$  is a water-soluble cation such as ammonium, sodium, potassium, magnesium, triethanolamine, diethanolamine and monoethanolamine. These compounds can be produced by the sulfonation of alpha olefins by means of uncomplexed sulfur trioxide, followed by neutralization of the acid reaction mixture in conditions such that any sultones that have been formed in the reaction are hydrolyzed to give the corresponding hydroxyalkanesulfonate. An example of a sulfonated olefin is sodium C14/C16 alpha olefin sulfonate.

Other suitable anionic surfactants are the linear alkylbenzene sulfonates of the form  $R_1-C_6H_4-SO_3M$ , wherein  $R_1$  is a saturated or unsaturated, branched or unbranched alkyl group from about 8 to about 24 carbon atoms, and  $M$  is a water-soluble cation such as ammonium, sodium, potassium, magnesium, triethanolamine, diethanolamine and monoethanolamine. These are formed by the sulfonation of linear alkyl benzene with sulfur trioxide. An example of this anionic surfactant is sodium dodecylbenzene sulfonate.

Still other anionic surfactants suitable for this cleansing component include the primary or secondary alkane sulfonates of the form  $R_1SO_3M$ , wherein  $R_1$  is a saturated or unsaturated, branched or unbranched alkyl chain from about 8 to about 24 carbon atoms, and  $M$  is a water-soluble cation such as ammonium, sodium, potassium, magnesium, triethanolamine, diethanolamine and monoethanolamine. These are commonly formed by the sulfonation of paraffins using sulfur dioxide in the presence of chlorine and ultraviolet light or another known sulfonation method. The sulfonation can occur in either the secondary or primary positions of

the alkyl chain. An example of an alkane sulfonate useful herein is alkali metal or ammonium C13-C17 paraffin sulfonates.

Still other suitable anionic surfactants are the alkyl sulfosuccinates, which include disodium N-octadecylsulfosuccinamate; diammonium lauryl sulfosuccinate; tetrasodium N-(1,2-dicarboxyethyl)-N-octadecylsulfosuccinate; diamyl ester of sodium sulfosuccinic acid; dihexyl ester of sodium sulfosuccinic acid; and dioctyl esters of sodium sulfosuccinic acid.

Also useful are taurates that are based on taurine, which is also known as 2-aminoethanesulfonic acid. Examples of taurates include N-alkyltaurines such as the one prepared by reacting dodecylamine with sodium isethionate as detailed in U.S. Patent No. 2,658,072 which is incorporated herein by reference in its entirety. Other examples based of taurine include the acyl taurines formed by the reaction of n-methyl taurine with fatty acids (having from about 8 to about 24 carbon atoms).

Another class of anionic surfactants suitable for use in the cleansing component is the acyl isethionates. The acyl isethionates typically have the formula  $R_1CO-O-CH_2CH_2SO_3M$  wherein  $R_1$  is a saturated or unsaturated, branched or unbranched alkyl group having from about 10 to about 30 carbon atoms, and  $M$  is a cation. These are typically formed by the reaction of fatty acids (having from about 8 to about 30 carbon atoms) with an alkali metal isethionate. Nonlimiting examples of these acyl isethionates include ammonium cocoyl isethionate, sodium cocoyl isethionate, sodium lauroyl isethionate, and mixtures thereof.

Still other suitable anionic surfactants are the alkylglyceryl ether sulfonates of the form  $R_1-OCH_2-C(OH)H-CH_2-SO_3M$ , wherein  $R_1$  is a saturated or unsaturated, branched or unbranched alkyl group from about 8 to about 24 carbon atoms, and  $M$  is a water-soluble cation such as ammonium, sodium, potassium, magnesium, triethanolamine, diethanolamine and monoethanolamine. These can be formed by the reaction of epichlorohydrin and sodium bisulfite with fatty alcohols (having from about 8 to about 24 carbon atoms) or other known methods. One example is sodium cocoglyceryl ether sulfonate.

Other suitable anionic surfactants include the sulfonated fatty acids of the form  $R_1-CH(SO_4)-COOH$  and sulfonated methyl esters of the form  $R_1-CH(SO_4)-CO-O-CH_3$ , where  $R_1$  is a saturated or unsaturated, branched or unbranched alkyl group from about 8 to about 24 carbon atoms. These can be formed by the sulfonation of fatty acids or alkyl methyl esters (having from about 8 to about 24 carbon atoms) with sulfur trioxide or by another known sulfonation technique. Examples include alpha sulphonated coconut fatty acid and lauryl methyl ester.

Other anionic materials include phosphates such as monoalkyl, dialkyl, and trialkylphosphate salts formed by the reaction of phosphorous pentoxide with monohydric branched or unbranched alcohols having from about 8 to about 24 carbon atoms. These could also be formed by other known phosphorylation methods. An example from this class of surfactants is sodium mono or dilaurylphosphate. Such phosphates may also be ethoxylated, e.g., ethoxylated monoalkyl phosphates.

Other anionic materials include acyl glutamates corresponding to the formula  $R_1CO-N(COOH)-CH_2CH_2-CO_2M$  wherein  $R_1$  is a saturated or unsaturated, branched or unbranched alkyl or alkenyl group of about 8 to about 24 carbon atoms, and  $M$  is a water-soluble cation. Nonlimiting examples of which include sodium lauroyl glutamate and sodium cocoyl glutamate.

Other anionic materials include alkanoyl sarcosinates corresponding to the formula  $R_1CON(CH_3)-CH_2CH_2-CO_2M$  wherein  $R_1$  is a saturated or unsaturated, branched or unbranched alkyl or alkenyl group of about 10 to about 20 carbon atoms, and  $M$  is a water-soluble cation. Nonlimiting examples of which include sodium lauroyl sarcosinate, sodium cocoyl sarcosinate, and ammonium lauroyl sarcosinate.

Other anionic materials include alkyl ether carboxylates corresponding to the formula  $R_1-(OCH_2CH_2)_x-OCH_2-CO_2M$  wherein  $R_1$  is a saturated or unsaturated, branched or unbranched alkyl or alkenyl group of about 8 to about 24 carbon atoms,  $x$  is 1 to 10, and  $M$  is a water-soluble cation. Nonlimiting examples of which include sodium laureth carboxylate.

Other anionic materials include acyl lactylates corresponding to the formula  $R_1CO-[O-CH(CH_3)-CO]_x-CO_2M$  wherein  $R_1$  is a saturated or unsaturated, branched or unbranched alkyl or alkenyl group of about 8 to about 24 carbon atoms,  $x$  is 3, and  $M$  is a water-soluble cation. Nonlimiting examples of which include sodium cocoyl lactylate.

Other anionic materials include the carboxylates, nonlimiting examples of which include sodium lauroyl carboxylate, sodium cocoyl carboxylate, and ammonium lauroyl carboxylate. Anionic fluorsurfactants can also be used.

Other anionic materials include natural soaps derived from the saponification of vegetable and/or animal fats & oils examples of which include sodium laurate, sodium myristate, palmitate, stearate, tallowate, cocoate.

Any counter cation,  $M$ , can be used on the anionic surfactant. Preferably, the counter cation is selected from the group consisting of sodium, potassium, ammonium, monoethanolamine, diethanolamine, and triethanolamine. More preferably, the counter cation is ammonium.

#### Nonionic Lathering Surfactants

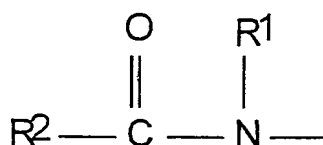
Nonlimiting examples of nonionic lathering surfactants for use in the cleansing component of the article are disclosed in McCutcheon's, Detergents and Emulsifiers, North American edition (1986), published by Allured Publishing Corporation; and McCutcheon's, Functional Materials, North American Edition (1992); both of which are incorporated by reference herein in their entirety.

Nonionic lathering surfactants useful herein include those selected from the group consisting of alkyl glucosides, alkyl polyglucosides, polyhydroxy fatty acid amides, alkoxyated fatty acid esters, sucrose esters, amine oxides, and mixtures thereof.

Alkyl glucosides and alkyl polyglucosides are useful herein, and can be broadly defined as condensation products of long chain alcohols, e.g., C8-30 alcohols, with sugars or starches or sugar or starch polymers, i.e., glycosides or polyglycosides. These compounds can be

represented by the formula  $(S)_n-O-R$  wherein S is a sugar moiety such as glucose, fructose, mannose, and galactose; n is an integer of from about 1 to about 1000, and R is a C8-30 alkyl group. Examples of long chain alcohols from which the alkyl group can be derived include decyl alcohol, cetyl alcohol, stearyl alcohol, lauryl alcohol, myristyl alcohol, oleyl alcohol, and the like. Preferred examples of these surfactants include those wherein S is a glucose moiety, R is a C8-20 alkyl group, and n is an integer of from about 1 to about 9. Commercially available examples of these surfactants include decyl polyglucoside (available as APG 325 CS from Henkel) and lauryl polyglucoside (available as APG 600CS and 625 CS from Henkel). Also useful are sucrose ester surfactants such as sucrose cocoate and sucrose laurate.

Other useful nonionic surfactants include polyhydroxy fatty acid amide surfactants, more specific examples of which include glucosamides, corresponding to the structural formula:



wherein:  $\text{R}^1$  is H,  $\text{C}_1\text{-C}_4$  alkyl, 2-hydroxyethyl, 2-hydroxypropyl, preferably  $\text{C}_1\text{-C}_4$  alkyl, more preferably methyl or ethyl, most preferably methyl;  $\text{R}^2$  is  $\text{C}_5\text{-C}_{31}$  alkyl or alkenyl, preferably  $\text{C}_7\text{-C}_{19}$  alkyl or alkenyl, more preferably  $\text{C}_9\text{-C}_{17}$  alkyl or alkenyl, most preferably  $\text{C}_{11}\text{-C}_{15}$  alkyl or alkenyl; and Z is a polyhydroxyhydrocarbyl moiety having a linear hydrocarbyl chain with a least 3 hydroxyls directly connected to the chain, or an alkoxyated derivative (preferably ethoxyated or propoxyated) thereof. Z preferably is a sugar moiety selected from the group consisting of glucose, fructose, maltose, lactose, galactose, mannose, xylose, and mixtures thereof. An especially preferred surfactant corresponding to the above structure is coconut alkyl N-methyl glucoside amide (i.e., wherein the  $\text{R}^2\text{CO-}$  moiety is derived from coconut oil fatty acids). Processes for making compositions containing polyhydroxy fatty acid amides are disclosed, for example, in G.B. Patent Specification 809,060, published February 18, 1959, by Thomas Hedley & Co., Ltd.; U. S. Patent No. 2,965,576, to E.R. Wilson, issued December 20, 1960; U. S. Patent No. 2,703,798, to A.M. Schwartz, issued March 8, 1955; and U. S. Patent No. 1,985,424, to Piggott, issued December 25, 1934; each of which are incorporated herein by reference in their entirety.

Other examples of nonionic surfactants include amine oxides. Amine oxides correspond to the general formula  $\text{R}_1\text{R}_2\text{R}_3\text{N}\rightarrow\text{O}$ , wherein  $\text{R}_1$  contains an alkyl, alkenyl or monohydroxy alkyl radical of from about 8 to about 18 carbon atoms, from 0 to about 10 ethylene oxide moieties, and from 0 to about 1 glyceryl moiety, and  $\text{R}_2$  and  $\text{R}_3$  contain from about 1 to about 3

carbon atoms and from 0 to about 1 hydroxy group, e.g., methyl, ethyl, propyl, hydroxyethyl, or hydroxypropyl radicals. The arrow in the formula is a conventional representation of a semipolar bond. Examples of amine oxides suitable for use in this invention include dimethyldodecylamine oxide, oleyldi(2-hydroxyethyl) amine oxide, dimethyloctylamine oxide, dimethyldecylamine oxide, dimethyl-tetradecylamine oxide, 3,6,9-trioxaheptadecyldiethylamine oxide, di(2-hydroxyethyl)-tetradecylamine oxide, 2-dodecoxyethyldimethylamine oxide, 3-dodecoxy-2-hydroxypropyldi(3-hydroxypropyl)amine oxide, dimethylhexadecylamine oxide.

Nonlimiting examples of preferred nonionic surfactants for use herein are those selected from the group consisting of C8-C14 glucose amides, C8-C14 alkyl polyglucosides, sucrose cocoate, sucrose laurate, lauramine oxide, cocoamine oxide, and mixtures thereof.

#### Cationic Lathering Surfactants

Cationic lathering surfactants are also useful in the cleansing component of the articles of the present invention. Suitable cationic lathering surfactants include, but are not limited to, fatty amines, di-fatty quaternary amines, tri-fatty quaternary amines, imidazolinium quaternary amines, and combinations thereof. Suitable fatty amines include monalkyl quaternary amines such as cetyltrimethylammonium bromide. A suitable quaternary amine is dialkylamidoethyl hydroxyethylmonium methosulfate. The fatty amines, however, are preferred. It is preferred that a lather booster is used when the cationic lathering surfactant is the primary lathering surfactant of the cleansing component. Additionally, nonionic surfactants have been found to be particularly useful in combination with such cationic lathering surfactants.

#### Amphoteric Lathering Surfactants

The term "amphoteric lathering surfactant," as used herein, is also intended to encompass zwitterionic surfactants, which are well known to formulators skilled in the art as a subset of amphoteric surfactants.

A wide variety of amphoteric lathering surfactants can be used in the cleansing component of the present invention. Particularly useful are those which are broadly described as derivatives of aliphatic secondary and tertiary amines, preferably wherein the nitrogen is in a cationic state, in which the aliphatic radicals can be straight or branched chain and wherein one of the radicals contains an ionizable water solubilizing group, e.g., carboxy, sulfonate, sulfate, phosphate, or phosphonate.

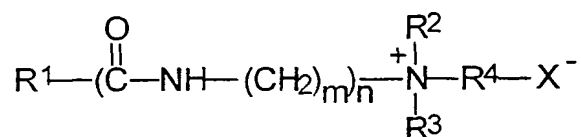
Nonlimiting examples of amphoteric surfactants useful in the component of the present invention are disclosed in McCutcheon's, Detergents and Emulsifiers, North American edition (1986), published by Allured Publishing Corporation; and McCutcheon's, Functional Materials, North American Edition (1992); both of which are incorporated by reference herein in their entirety.

Nonlimiting examples of amphoteric or zwitterionic surfactants are those selected from the group consisting of betaines, sultaines, hydroxysultaines, alkyliminoacetates, iminodialkanoates, aminoalkanoates, and mixtures thereof.

Examples of betaines include the higher alkyl betaines, such as coco dimethyl carboxymethyl betaine, lauryl dimethyl carboxymethyl betaine, lauryl dimethyl alpha-carboxyethyl betaine, cetyl dimethyl carboxymethyl betaine, cetyl dimethyl betaine (available as Lonzaine 16SP from Lonza Corp.), lauryl bis-(2-hydroxyethyl) carboxymethyl betaine, oleyl dimethyl gamma-carboxypropyl betaine, lauryl bis-(2-hydroxypropyl)alpha-carboxyethyl betaine, coco dimethyl sulfopropyl betaine, lauryl dimethyl sulfoethyl betaine, lauryl bis-(2-hydroxyethyl) sulfopropyl betaine, amidobetaines and amidosulfobetaines (wherein the  $\text{RCONH}(\text{CH}_2)_3$  radical is attached to the nitrogen atom of the betaine), oleyl betaine (available as amphoteric Velvetex OLB-50 from Henkel), and cocamidopropyl betaine (available as Velvetex BK-35 and BA-35 from Henkel).

Examples of sultaines and hydroxysultaines include materials such as cocamidopropyl hydroxysultaine (available as Mirataine CBS from Rhone-Poulenc).

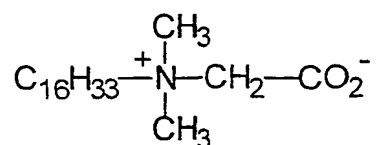
Preferred for use herein are amphoteric surfactants having the following structure:



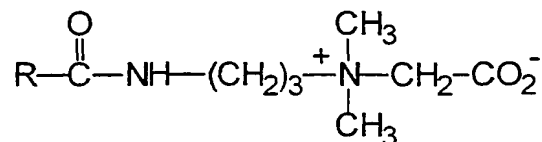
wherein  $\text{R}^1$  is unsubstituted, saturated or unsaturated, straight or branched chain alkyl having from about 9 to about 22 carbon atoms. Preferred  $\text{R}^1$  has from about 11 to about 18 carbon atoms; more preferably from about 12 to about 18 carbon atoms; more preferably still from about 14 to about 18 carbon atoms;  $m$  is an integer from 1 to about 3, more preferably from about 2 to about 3, and more preferably about 3;  $n$  is either 0 or 1, preferably 1;  $\text{R}^2$  and  $\text{R}^3$  are independently selected from the group consisting of alkyl having from 1 to about 3 carbon atoms, unsubstituted or mono-substituted with hydroxy, preferred  $\text{R}^2$  and  $\text{R}^3$  are  $\text{CH}_3$ ;  $\text{X}$  is selected from the group consisting of  $\text{CO}_2$ ,  $\text{SO}_3$  and  $\text{SO}_4$ ;  $\text{R}^4$  is selected from the group consisting of saturated or unsaturated, straight or branched chain alkyl, unsubstituted or monosubstituted with hydroxy, having from 1 to about 5 carbon atoms. When  $\text{X}$  is  $\text{CO}_2$ ,  $\text{R}^4$  preferably has 1 or 3 carbon atoms, more preferably 1 carbon atom. When  $\text{X}$  is  $\text{SO}_3$  or  $\text{SO}_4$ ,  $\text{R}^4$  preferably has from about 2 to about 4 carbon atoms, more preferably 3 carbon atoms.

Examples of amphoteric surfactants of the present invention include the following compounds:

Cetyl dimethyl betaine (this material also has the CTFA designation cetyl betaine)

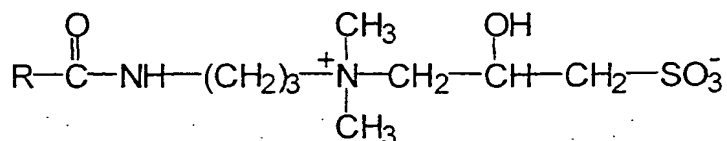


## Cocamidopropylbetaine



wherein R has from about 9 to about 13 carbon atoms

## Cocamidopropyl hydroxy sultaine



wherein R has from about 9 to about 13 carbon atoms,

Examples of other useful amphoteric surfactants are alkyliminoacetates, and iminodialkanoates and aminoalkanoates of the formulas  $\text{RN}[(\text{CH}_2)_m\text{CO}_2\text{M}]_2$  and  $\text{RNH}(\text{CH}_2)_m\text{CO}_2\text{M}$  wherein  $m$  is from 1 to 4, R is a C<sub>8</sub>-C<sub>22</sub> alkyl or alkenyl, and M is H, alkali metal, alkaline earth metal ammonium, or alkanolammonium. Also included are imidazolinium and ammonium derivatives. Specific examples of suitable amphoteric surfactants include sodium 3-dodecyl-aminopropionate, sodium 3-dodecylaminopropane sulfonate, N-higher alkyl aspartic acids such as those produced according to the teaching of U. S. Patent 2,438,091 which is incorporated herein by reference in its entirety; and the products sold under the trade name "Miranol" and described in U. S. Patent 2,528,378, which is incorporated herein by reference in its entirety. Other examples of useful amphoterics include amphoteric phosphates, such as coamidopropyl PG-dimonium chloride phosphate (commercially available as Monaquat PTC, from Mona Corp.). Also useful are amphotoacetates such as disodium lauroamphodiacetate, sodium lauroamphoacetate, and mixtures thereof.

Preferred lathering surfactants are selected from the group consisting of anionic lathering surfactants selected from the group consisting of ammonium lauroyl sarcosinate, sodium trideceth sulfate, sodium lauroyl sarcosinate, ammonium laureth sulfate, sodium laureth sulfate, ammonium lauryl sulfate, sodium lauryl sulfate, ammonium cocoyl isethionate, sodium cocoyl isethionate, sodium lauroyl isethionate, sodium cetyl sulfate, sodium monolauryl phosphates, ethoxylated monoalkyl phosphates, sodium cocoglyceryl ether sulfonate, sodium C<sub>9</sub>-C<sub>22</sub> soap, and combinations thereof; nonionic lathering surfactants selected from the group consisting of lauramine oxide, cocoamine oxide, decyl polyglucose, lauryl polyglucose, sucrose cocoate, C12-14 glucosamides, sucrose laurate, and combinations thereof; cationic lathering surfactants selected from the group consisting of fatty amines, di-fatty quaternary amines, tri-fatty quaternary amines, imidazolinium quaternary amines, and combinations thereof; amphoteric lathering surfactants selected from the group consisting of disodium

lauroamphodiacetate, sodium lauroamphoacetate, cetyl dimethyl betaine, cocoamidopropyl betaine, cocoamidopropyl hydroxy sultaine, and combinations thereof.

#### Conditioning Component

In certain embodiments of the present invention, the articles essentially comprise a benefit component that is a conditioning component. This conditioning component is disposed adjacent to the water insoluble substrate and comprises from about 10% to about 1000%, more preferably, from about 10% to about 500%, and most preferably from about 10% to about 250%, by weight of the laminate web, of a conditioning agent. Preferably, the conditioning component is disposed on the surface of one or more of the layers of the laminate web. Even more preferably, the conditioning component is disposed on the one or more exterior surfaces of the resulting laminate web. Preferably, the conditioning agent is selected from the group consisting of hydrophobic conditioning agents, hydrophilic conditioning agents, structured conditioning agents, and combinations thereof.

#### Hydrophobic Conditioning Agents

The articles of the present invention may comprise one or more hydrophobic conditioning agents that are useful for providing a conditioning benefit to the skin or hair during the use of the article. The articles of present invention preferably comprise from about 0.5% to about 1,000%, more preferably from about 1% to about 200%, and most preferably from about 10% to about 100%, by weight of the laminate web, of a hydrophobic conditioning agent.

The hydrophobic conditioning agent may be selected from one or more hydrophobic conditioning agents such that the weighted arithmetic mean solubility parameter of the hydrophobic conditioning agent is less than or equal to 10.5. It is recognized, based on this mathematical definition of solubility parameters, that it is possible, for example, to achieve the required weighted arithmetic mean solubility parameter, i.e., less than or equal to 10.5, for a hydrophobic conditioning agent comprising two or more compounds if one of the compounds has an individual solubility parameter greater than 10.5.

Solubility parameters are well known to the formulation chemist of ordinary skill in the art and are routinely used as a guide for determining compatibility's and solubilities of materials in the formulation process.

The solubility parameter of a chemical compound,  $\delta$ , is defined as the square root of the cohesive energy density for that compound. Typically, a solubility parameter for a compound is calculated from tabulated values of the additive group contributions for the heat of vaporization and molar volume of the components of that compound, using the following equation:

$$\delta = \left[ \frac{\sum_i E_i}{\sum_i m_i} \right]^{1/2}$$

wherein  $\sum_i E_i$  = the sum of the heat of vaporization additive group contributions, and  $\sum_i m_i$  = the sum of the molar volume additive group contributions

Standard tabulations of heat of vaporization and molar volume additive group contributions for a wide variety of atoms and groups of atoms are collected in Barton, A.F.M. Handbook of Solubility Parameters, CRC Press, Chapter 6, Table 3, pp. 64-66 (1985), which is incorporated by reference herein in its entirety. The above solubility parameter equation is described in Fedors, R.F., "A Method for Estimating Both the Solubility Parameters and Molar Volumes of Liquids", Polymer Engineering and Science, vol. 14, no. 2, pp. 147-154 (February 1974), which is incorporated by reference herein in its entirety.

Solubility parameters obey the law of mixtures such that the solubility parameter for a mixture of materials is given by the weighted arithmetic mean (i.e. the weighted average) of the solubility parameters for each component of that mixture. See, Handbook of Chemistry and Physics, 57th edition, CRC Press, p. C-726 (1976-1977), which is incorporated by reference herein in its entirety.

Formulation chemists typically report and use solubility parameters in units of  $(\text{cal}/\text{cm}^3)^{1/2}$ . The tabulated values of additive group contributions for heat of vaporization in the Handbook of Solubility Parameters are reported in units of kJ/mol. However, these tabulated heat of vaporization values are readily converted to cal/mol using the following well-known relationships:

$$1 \text{ J/mol} = 0.239006 \text{ cal/mol} \quad \text{and} \quad 1000 \text{ J} = 1 \text{ kJ.}$$

See Gordon, A.J. et al., The Chemist's Companion, John Wiley & Sons, pp. 456-463, (1972), which is incorporated by reference herein in its entirety.

Solubility parameters have also been tabulated for a wide variety of chemical materials. Tabulations of solubility parameters are found in the above-cited Handbook of Solubility Parameters. Also, see "Solubility Effects In Product, Package, Penetration, And Preservation",

C.D. Vaughan, Cosmetics and Toiletries, vol. 103, October 1988, pp. 47-69, which is incorporated by reference herein in its entirety.

Nonlimiting examples of hydrophobic conditioning agents include those selected from the group consisting of mineral oil, petrolatum, lecithin, hydrogenated lecithin, lanolin, lanolin derivatives, C7-C40 branched chain hydrocarbons, C1-C30 alcohol esters of C1-C30 carboxylic acids, C1-C30 alcohol esters of C2-C30 dicarboxylic acids, monoglycerides of C1-C30 carboxylic acids, diglycerides of C1-C30 carboxylic acids, triglycerides of C1-C30 carboxylic acids, ethylene glycol monoesters of C1-C30 carboxylic acids, ethylene glycol diesters of C1-C30 carboxylic acids, propylene glycol monoesters of C1-C30 carboxylic acids, propylene glycol diesters of C1-C30 carboxylic acids, C1-C30 carboxylic acid monoesters and polyesters of sugars, polydialkylsiloxanes, polydiarylsiloxanes, polyalkarylsiloxanes, cyclomethicones having 3 to 9 silicon atoms, vegetable oils, hydrogenated vegetable oils, polypropylene glycol C4-C20 alkyl ethers, di C8-C30 alkyl ethers, and combinations thereof.

Mineral oil, which is also known as petrolatum liquid, is a mixture of liquid hydrocarbons obtained from petroleum. See The Merck Index, Tenth Edition, Entry 7048, p. 1033 (1983) and International Cosmetic Ingredient Dictionary, Fifth Edition, vol. 1, p.415-417 (1993), which are incorporated by reference herein in their entirety.

Petrolatum, which is also known as petroleum jelly, is a colloidal system of nonstraight-chain solid hydrocarbons and high-boiling liquid hydrocarbons, in which most of the liquid hydrocarbons are held inside the micelles. See The Merck Index, Tenth Edition, Entry 7047, p. 1033 (1983); Schindler, Drug. Cosmet. Ind., 89, 36-37, 76, 78-80, 82 (1961); and International Cosmetic Ingredient Dictionary, Fifth Edition, vol. 1, p. 537 (1993), which are incorporated by reference herein in their entirety.

Lecithin is also useful as a hydrophobic conditioning agent. It is a naturally occurring mixture of the diglycerides of certain fatty acids, linked to the choline ester of phosphoric acid.

Straight and branched chain hydrocarbons having from about 7 to about 40 carbon atoms are useful herein. Nonlimiting examples of these hydrocarbon materials include dodecane, isododecane, squalane, cholesterol, hydrogenated polyisobutylene, docosane (i.e. a C<sub>22</sub> hydrocarbon), hexadecane, isohexadecane (a commercially available hydrocarbon sold as Permethyl® 101A by Presperse, South Plainfield, NJ). Also useful are the C7-C40 isoparaffins, which are C7-C40 branched hydrocarbons. Polydecene, a branched liquid hydrocarbon, is also useful herein and is commercially available under the tradenames Puresyn 100® and Puresyn 3000® from Mobile Chemical (Edison, NJ).

Also useful are C1-C30 alcohol esters of C1-C30 carboxylic acids and of C2-C30 dicarboxylic acids, including straight and branched chain materials as well as aromatic derivatives. Also useful are esters such as monoglycerides of C1-C30 carboxylic acids, diglycerides of C1-C30 carboxylic acids, triglycerides of C1-C30 carboxylic acids, ethylene glycol monoesters of C1-C30 carboxylic acids, ethylene glycol diesters of C1-C30 carboxylic acids, propylene glycol monoesters of C1-C30 carboxylic acids, and propylene glycol diesters of

C1-C30 carboxylic acids. Straight chain, branched chain and aryl carboxylic acids are included herein. Also useful are propoxylated and ethoxylated derivatives of these materials. Nonlimiting examples include diisopropyl sebacate, diisopropyl adipate, isopropyl myristate, isopropyl palmitate, myristyl propionate, ethylene glycol distearate, 2-ethylhexyl palmitate, isodecyl neopentanoate, di-2-ethylhexyl maleate, cetyl palmitate, myristyl myristate, stearyl stearate, cetyl stearate, behenyl behenrate, dioctyl maleate, dioctyl sebacate, diisopropyl adipate, cetyl octanoate, diisopropyl dilinoleate, carpylic/capric triglyceride, PEG-6 caprylic/capric triglyceride, PEG-8 caprylic/capric triglyceride, and combinations thereof.

Also useful are various C1-C30 monoesters and polyesters of sugars and related materials. These esters are derived from a sugar or polyol moiety and one or more carboxylic acid moieties. Depending on the constituent acid and sugar, these esters can be in either liquid or solid form at room temperature. Examples of liquid esters include: glucose tetraoleate, the glucose tetraesters of soybean oil fatty acids (unsaturated), the mannose tetraesters of mixed soybean oil fatty acids, the galactose tetraesters of oleic acid, the arabinose tetraesters of linoleic acid, xylose tetralinoleate, galactose pentaoleate, sorbitol tetraoleate, the sorbitol hexaesters of unsaturated soybean oil fatty acids, xylitol pentaoleate, sucrose tetraoleate, sucrose pentaoleate, sucrose hexaoleate, sucrose hepatoleate, sucrose octaoleate, and mixtures thereof. Examples of solid esters include: sorbitol hexaester in which the carboxylic acid ester moieties are palmitoleate and arachidate in a 1:2 molar ratio; the octaester of raffinose in which the carboxylic acid ester moieties are linoleate and behenate in a 1:3 molar ratio; the heptaester of maltose wherein the esterifying carboxylic acid moieties are sunflower seed oil fatty acids and lignocerate in a 3:4 molar ratio; the octaester of sucrose wherein the esterifying carboxylic acid moieties are oleate and behenate in a 2:6 molar ratio; and the octaester of sucrose wherein the esterifying carboxylic acid moieties are laurate, linoleate and behenate in a 1:3:4 molar ratio. A preferred solid material is sucrose polyester in which the degree of esterification is 7-8, and in which the fatty acid moieties are C18 mono- and/or di-unsaturated and behenic, in a molar ratio of unsaturates: behenic of 1:7 to 3:5. A particularly preferred solid sugar polyester is the octaester of sucrose in which there are about 7 behenic fatty acid moieties and about 1 oleic acid moiety in the molecule. Other materials include cottonseed oil or soybean oil fatty acid esters of sucrose. The ester materials are further described in, U. S. Patent No. 2,831,854, U. S. Patent No. 4,005,196, to Jandacek, issued January 25, 1977; U. S. Patent No. 4,005,195, to Jandacek, issued January 25, 1977, U. S. Patent No. 5,306,516, to Letton et al., issued April 26, 1994; U. S. Patent No. 5,306,515, to Letton et al., issued April 26, 1994; U. S. Patent No. 5,305,514, to Letton et al., issued April 26, 1994; U. S. Patent No. 4,797,300, to Jandacek et al., issued January 10, 1989; U. S. Patent No. 3,963,699, to Rizzi et al, issued June 15, 1976; U. S. Patent No. 4,518,772, to Volpenhein, issued May 21, 1985; and U. S. Patent No. 4,517,360, to Volpenhein, issued May 21, 1985; each of which is incorporated by reference herein in its entirety.

Nonvolatile silicones such as polydialkylsiloxanes, polydiarylsiloxanes, and polyalkarylsiloxanes are also useful oils. These silicones are disclosed in U. S. Patent No. 5,069,897, to Orr, issued December 3, 1991, which is incorporated by reference herein in its entirety. The polyalkylsiloxanes correspond to the general chemical formula  $R_3SiO[R_2SiO]_xSiR_3$  wherein R is an alkyl group (preferably R is methyl or ethyl, more preferably methyl) and x is an integer up to about 500, chosen to achieve the desired molecular weight. Commercially available polyalkylsiloxanes include the polydimethylsiloxanes, which are also known as dimethicones, nonlimiting examples of which include the Vicasil<sup>®</sup> series sold by General Electric Company and the Dow Corning<sup>®</sup> 200 series sold by Dow Corning Corporation. Specific examples of polydimethylsiloxanes useful herein include Dow Corning<sup>®</sup> 225 fluid having a viscosity of 10 centistokes and a boiling point greater than 200°C, and Dow Corning<sup>®</sup> 200 fluids having viscosities of 50, 350, and 12,500 centistokes, respectively, and boiling points greater than 200°C. Also useful are materials such as trimethylsiloxysilicate, which is a polymeric material corresponding to the general chemical formula  $[(CH_2)_3SiO_{1/2}]_x[SiO_2]_y$ , wherein x is an integer from about 1 to about 500 and y is an integer from about 1 to about 500. A commercially available trimethylsiloxysilicate is sold as a mixture with dimethicone as Dow Corning<sup>®</sup> 593 fluid. Also useful herein are dimethiconols, which are hydroxy terminated dimethyl silicones. These materials can be represented by the general chemical formulas  $R_3SiO[R_2SiO]_xSiR_2OH$  and  $HOR_2SiO[R_2SiO]_xSiR_2OH$  wherein R is an alkyl group (preferably R is methyl or ethyl, more preferably methyl) and x is an integer up to about 500, chosen to achieve the desired molecular weight. Commercially available dimethiconols are typically sold as mixtures with dimethicone or cyclomethicone (e.g. Dow Corning<sup>®</sup> 1401, 1402, and 1403 fluids). Also useful herein are polyalkylaryl siloxanes, with polymethylphenyl siloxanes having viscosities from about 15 to about 65 centistokes at 25°C being preferred. These materials are available, for example, as SF 1075 methylphenyl fluid (sold by General Electric Company) and 556 Cosmetic Grade phenyl trimethicone fluid (sold by Dow Corning Corporation). Alkylated silicones such as methyldecyl silicone and methyloctyl silicone are useful herein and are commercially available from General Electric Company. Also useful herein are alkyl modified siloxanes such as alkyl methicones and alkyl dimethicones wherein the alkyl chain contains 10 to 50 carbons. Such siloxanes are commercially available under the tradenames ABIL WAX 9810 ( $C_{24}$ - $C_{28}$  alkyl methicone) (sold by Goldschmidt) and SF1632 (cetearyl methicone)(sold by General Electric Company).

Vegetable oils and hydrogenated vegetable oils are also useful herein. Examples of vegetable oils and hydrogenated vegetable oils include safflower oil, castor oil, coconut oil, cottonseed oil, menhaden oil, palm kernel oil, palm oil, peanut oil, soybean oil, rapeseed oil, linseed oil, rice bran oil, pine oil, sesame oil, sunflower seed oil, hydrogenated safflower oil, hydrogenated castor oil, hydrogenated coconut oil, hydrogenated cottonseed oil, hydrogenated menhaden oil, hydrogenated palm kernel oil, hydrogenated palm oil, hydrogenated peanut oil,

hydrogenated soybean oil, hydrogenated rapeseed oil, hydrogenated linseed oil, hydrogenated rice bran oil, hydrogenated sesame oil, hydrogenated sunflower seed oil, and mixtures thereof.

Also useful are C4-C20 alkyl ethers of polypropylene glycols, C1-C20 carboxylic acid esters of polypropylene glycols, and di-C8-C30 alkyl ethers. Nonlimiting examples of these materials include PPG-14 butyl ether, PPG-15 stearyl ether, dioctyl ether, dodecyl octyl ether, and mixtures thereof.

Hydrophobic chelating agents are also useful herein as hydrophobic conditioning agents. Suitable agents are described in U. S. Patent No. 4,387,244, issued to Scanlon et al. on June 7, 1983, and copending U. S. Patent Application Serial Nos. 09/258,747 and 09/259,485, filed in the names of Schwartz et al. on February 26, 1999.

Preferred hydrophobic conditioning agents are selected from the group consisting of mineral oil, petrolatum, lecithin, hydrogenated lecithin, lanolin, lanolin derivatives, C7-C40 branched chain hydrocarbons, C1-C30 alcohol esters of C1-C30 carboxylic acids, C1-C30 alcohol esters of C2-C30 dicarboxylic acids, monoglycerides of C1-C30 carboxylic acids, diglycerides of C1-C30 carboxylic acids, triglycerides of C1-C30 carboxylic acids, ethylene glycol monoesters of C1-C30 carboxylic acids, ethylene glycol diesters of C1-C30 carboxylic acids, propylene glycol monoesters of C1-C30 carboxylic acids, propylene glycol diesters of C1-C30 carboxylic acids, C1-C30 carboxylic acid monoesters and polyesters of sugars, polydialkylsiloxanes, polydiarylsiloxanes, polyalkylarylsiloxanes, cyclomethicones having 3 to 9 silicon atoms, vegetable oils, hydrogenated vegetable oils, polypropylene glycol C4-C20 alkyl ethers, di C8-C30 alkyl ethers, and combinations thereof.

#### Hydrophilic Conditioning Agents

The articles of the present invention may also comprise a benefit component that comprises one or more hydrophilic conditioning agents. Nonlimiting examples of hydrophilic conditioning agents include those selected from the group consisting of polyhydric alcohols, polypropylene glycols, polyethylene glycols, ureas, pyrrolidone carboxylic acids, ethoxylated and/or propoxylated C3-C6 diols and triols, alpha-hydroxy C2-C6 carboxylic acids, ethoxylated and/or propoxylated sugars, polyacrylic acid copolymers, sugars having up to about 12 carbons atoms, sugar alcohols having up to about 12 carbon atoms, and mixtures thereof. Specific examples of useful hydrophilic conditioning agents include materials such as urea; guanidine; glycolic acid and glycolate salts (e.g., ammonium and quaternary alkyl ammonium); lactic acid and lactate salts (e.g., ammonium and quaternary alkyl ammonium); sucrose, fructose, glucose, eruthrose, erythritol, sorbitol, mannitol, glycerol, hexanetriol, propylene glycol, butylene glycol, hexylene glycol, and the like; polyethylene glycols such as PEG-2, PEG-3, PEG-30, PEG-50, polypropylene glycols such as PPG-9, PPG-12, PPG-15, PPG-17, PPG-20, PPG-26, PPG-30, PPG-34; alkoxylated glucose; hyaluronic acid; cationic skin conditioning polymers (e.g., quaternary ammonium polymers such as Polyquaternium polymers); and mixtures thereof. Glycerol, in particular, is a preferred hydrophilic conditioning agent in the articles of the present invention. Also useful are materials such as aloe vera in any of its variety of forms (e.g., aloe

vera gel), chitosan and chitosan derivatives, e.g., chitosan lactate, lactamide monoethanolamine; acetamide monoethanolamine; and mixtures thereof. Also useful are propoxylated glycerols as described in propoxylated glycerols described in U. S. Patent No. 4,976,953, to Orr et al., issued December 11, 1990, which is incorporated by reference herein in its entirety.

The benefit component may be made into a variety of forms. In one embodiment of the present invention, the benefit component is in the form of an emulsion. For instance, oil-in-water, water-in-oil, water-in-oil-in-water, and oil-in-water-in-silicone emulsions are useful herein. As used in the context of emulsions, "water" may refer not only to water but also water soluble or water miscible agents like glycerin.

Preferred benefit components comprise an emulsion, which further comprises an aqueous phase and an oil phase. As will be understood by the skilled artisan, a given component will distribute primarily into either the aqueous or oil phase, depending on the water solubility/dispersibility of the therapeutic benefit agent in the component. In one embodiment, the oil phase comprises one or more hydrophobic conditioning agents. In another embodiment, the aqueous phase comprises one or more hydrophilic conditioning agents.

Benefit components of the present invention, which are emulsion form, generally contain an aqueous phase and an oil or lipid phase. Suitable oils or lipids may be derived from animals, plants, or petroleum and may be natural or synthetic (i.e., man-made). Suitable oil and aqueous phase components are discussed above. Preferred emulsion forms include water-in-oil emulsions, water-in-silicone emulsions, and other inverse emulsions. Additionally, preferred emulsions also contain a hydrophilic conditioning agent such as glycerin such that a glycerin-in-oil emulsion results.

The benefit component, especially the conditioning component, of the present invention that is in emulsion form will preferably further contain from about 1% to about 10%, more preferably from about 2% to about 5%, of an emulsifier (i.e., a surfactant), based on the weight of benefit component. Emulsifiers may be nonionic, anionic or cationic. Suitable emulsifiers are disclosed above as well as in U.S. Patent 3,755,560, issued August 28, 1973, Dickert et al.; U.S. Patent 4,421,769, issued December 20, 1983, Dixon et al.; and McCutcheon's Detergents and Emulsifiers, North American Edition, pages 317-324 (1986). Benefit components in emulsion form may also contain an anti-foaming agent to minimize foaming upon application to the skin. Anti-foaming agents include high molecular weight silicones and other materials well known in the art for such use.

The benefit component may also be in the form of a microemulsion. As used herein, "microemulsion" refers to thermodynamic stable mixtures of two immiscible solvents (one apolar and the other polar) stabilized by an amphiphilic molecule, a surfactant. Preferred microemulsions include water-in-oil microemulsions.

### Structured Conditioning Agents

The benefit component that is a conditioning component may also comprise structured conditioning agents. Suitable structured conditioning agents include, but are not limited to, vesicular structures such as ceramides, liposomes, and the like.

In another embodiment, the conditioning agents of the benefit component are comprised within a coacervate-forming composition. Preferably, the coacervate-forming composition comprises a cationic polymer, an anionic surfactant, and a dermatologically acceptable carrier for the polymer and surfactant. The cationic polymer may be selected from the group consisting of natural backbone quaternary ammonium polymers, synthetic backbone quaternary ammonium polymers, natural backbone amphoteric type polymers, synthetic backbone amphoteric type polymers, and combinations thereof.

More preferably, the cationic polymer is selected from the group consisting of natural backbone quaternary ammonium polymers selected from the group consisting of Polyquaternium-4, Polyquaternium-10, Polyquaternium-24, PG-hydroxyethylcellulose alkyldimonium chlorides, guar hydroxypropyltrimonium chloride, hydroxypropylguar hydroxypropyltrimonium chloride, and combinations thereof; synthetic backbone quaternary ammonium polymers selected from the group consisting of Polyquaternium-2, Polyquaternium-6, Polyquaternium-7, Polyquaternium-11, Polyquaternium-16, Polyquaternium-17, Polyquaternium-18, Polyquaternium-28, Polyquaternium-32, Polyquaternium-37, Polyquaternium-43, Polyquaternium-44, Polyquaternium-46, polymethacrylamidopropyl trimonium chloride, acrylamidopropyl trimonium chloride/acrylamide copolymer, and combinations thereof; natural backbone amphoteric type polymers selected from the group consisting of chitosan, quaternized proteins, hydrolyzed proteins, and combinations thereof; synthetic backbone amphoteric type polymers selected from the group consisting of Polyquaternium-22, Polyquaternium-39, Polyquaternium-47, adipic acid/dimethylaminohydroxypropyl diethylenetriamine copolymer, polyvinylpyrrolidone/dimethylaminoethyl methacrylate copolymer, vinylcaprolactam/polyvinylpyrrolidone/dimethylaminoethylmethacrylate copolymer, vinylcaprolactam/polyvinylpyrrolidone/dimethylaminopropylmethacrylamide terpolymer, polyvinylpyrrolidone/dimethylaminopropylmethacrylamide copolymer, polyamine, and combinations thereof; and combinations thereof. Even more preferably, the cationic polymer is a synthetic backbone amphoteric type polymer. Even still more preferably, the cationic polymer is a polyamine.

When the cationic polymer is a polyamine, it is preferred that the cationic polyamine polymer be selected from the group consisting of polyethyleneimines, polyvinylamines, polypropyleneimines, polylysines and combinations thereof. Even more preferably, the cationic polyamine polymer is a polyethyleneimine.

In certain embodiments in which the cationic polymer is a polyamine, the polyamine may be hydrophobically or hydrophilically modified. In this instance, the cationic polyamine

polymer is selected from the group consisting of benzylated polyamines, ethoxylated polyamines, propoxylated polyamines, alkylated polyamines, amidated polyamines, esterified polyamines and combinations thereof. The coacervate-forming composition comprises from about 0.01% to about 20%, more preferably from about 0.05% to about 10%, and most preferably from about 0.1% to about 5%, by weight of the coacervate-forming composition, of the cationic polymer.

Suitable anionic surfactants for use in the coacervate-forming context include those discussed above as related to the "cleansing component." Preferably, for the coacervate-forming composition, the anionic surfactant is selected from the group consisting of sarcosinates, glutamates, sodium alkyl sulfates, ammonium alkyl sulfates, sodium alkyleth sulfates, ammonium alkyleth sulfates, ammonium laureth-n-sulfates, sodium laureth-n-sulfates, iscthonates, glycerylether sulfonates, sulfosuccinates and combinations thereof. More preferably, the anionic surfactant is selected from the group consisting of sodium lauroyl sarcosinate, monosodium lauroyl glutamate, sodium alkyl sulfates, ammonium alkyl sulfates, sodium alkyleth sulfates, ammonium alkyleth sulfates, and combinations thereof.

Suitable coacervate-forming compositions are further described in copending U. S. patent applications Serial Nos. 09/397,747, filed in the name of Schwartz et al.; 09/397,746, filed in the name of Heinrich et al.; 09/397,712, filed in the name of Schwartz et al.; 09/397,723, filed in the name of Heinrich et al.; and 09/397,722, filed in the name of Venkitaraman et al.; each of which were filed on September 16, 1999.

Alternatively, the coacervate-forming composition may comprise an anionic polymer, a cationic surfactant, and a dermatologically acceptable carrier for the polymer and surfactant. The anionic polymer may be selected from the group consisting of polyacrylic acid polymers, polyacrylamide polymers, copolymers of acrylic acid, acrylamide, and other natural or synthetic polymers (e.g., polystyrene, polybutene, polyurethane, etc.), naturally derived gums, and combinations thereof. Suitable gums include alginates (e.g., propylene glycol alginate), pectins, chitosans (e.g., chitosan lactate), and modified gums (e.g., starch octenyl succinate), and combinations thereof. More preferably, the anionic polymer is selected from the group consisting of polyacrylic acid polymers, polyacrylamide polymers, pectins, chitosans, and combinations thereof. Preferred articles of the present invention comprise from about 0.01% to about 20%, more preferably from about 0.05% to about 10%, and most preferably from about 0.1% to about 5%, by weight of the coacervate-forming composition, of the anionic polymer. Suitable cationic surfactants include, but are not limited to, those discussed herein.

#### Cosmetic Component

In the personal care area, the benefit component of the article is suitable for providing therapeutic or aesthetic skin or hair benefits by deposition onto such surfaces of not only conditioning agents but also various agents including, but not limited to, deodorant/antiperspirant actives, anti-acne actives, anti-wrinkle actives, anti-microbial actives, anti-fungal actives, anti-inflammatory actives, topical anesthetic actives, artificial tanning

agents and accelerators, anti-viral agents, enzymes, sunscreen actives, anti-oxidants, skin exfoliating agents, and combinations thereof. These additional actives are detailed further below in the "optional ingredients" section.

Additional cosmetic components that are suitable for inclusion into the present article are foundations, blushes, blemish covering compositions, and other typical cosmetic coloring products. Such components, in effect, result in an article of the present invention that is suitable for make-up application.

It should also be understood that the benefit component may comprise a combination of cleansing components, conditioning components, cosmetic components, cleaning components, polishing components, etc. in such a way that they form a unitary benefit component with indistinguishable ingredients and multiple functions.

#### Cleaning Component

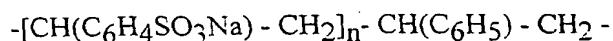
For household care uses, the benefit component of the article is suitable for providing cleaning benefits of household areas, e.g., hard surfaces like counter tops, walls, basins, tubs, floors, windows, etc.. Such benefit components are hereafter referred to as cleaning components. Preferably, such cleaning components are liquids since they can be easily applied to surfaces in a neat and concentrated manner to the soiled area. Solid cleaning components are, however, also acceptable so long as they are dissolved in a water or another liquid upon use. Preferably, the cleaning components of the present invention comprise a safe and effective amount of a relatively hydrophilic polymer that renders the treated surface hydrophilic. This increase in hydrophilicity provides improved final appearance by providing "sheeting" of the water from the surface and/or spreading of the water on the surface, and this effect is preferably seen when the surface is rewetted and even when subsequently dried after the rewetting.

For those articles of the present invention that are intended to be used as a daily shower product, the "sheeting" effect is particularly noticeable because most of the surfaces treated are vertical surfaces. Thus, benefits have been noted on glass, ceramic and even tougher to wet surfaces such as porcelain enamel. When the water "sheets" evenly off the surface and/or spreads on the surface, it minimizes the formation of, e.g., "hard water spots" that form upon drying. For an article of the present invention that is intended to be used in the context of a floor cleaner, the polymer improves surface wetting and assists cleaning performance.

Polymer substantivity is beneficial as it prolongs the sheeting and cleaning benefits. Another important feature of preferred polymers is lack of residue upon drying. Compositions comprising preferred polymers dry more evenly on floors while promoting an end result with little or no haze.

Many materials can provide the sheeting and anti-spotting benefits, but the preferred materials are polymers that contain amine oxide hydrophilic groups. Polymers that contain other hydrophilic groups such a sulfonate, pyrrolidone, and/or carboxylate groups can also be used. Examples of desirable poly-sulfonate polymers include polyvinylsulfonate, and more

preferably polystyrene sulfonate, such as those sold by Monomer-Polymer Dajac (1675 Bustleton Pike, Feasterville, Pennsylvania 19053). A typical formula is as follows.



wherein n is a number to give the appropriate molecular weight as disclosed below.

Typical molecular weights are from about 10,000 to about 1,000,000, preferably from about 200,000 to about 700,000. Preferred polymers containing pyrrolidone functionalities include polyvinyl pyrrolidone, quaternized pyrrolidone derivatives (such as Gafquat 755N from International Specialty Products), and co-polymers containing pyrrolidone, such as polyvinylpyrrolidone /dimethylaminoethylmethacrylate (available from ISP) and polyvinyl pyrrolidone/acrylate (available from BASF). Other materials can also provide substantivity and hydrophilicity including cationic materials that also contain hydrophilic groups and polymers that contain multiple ether linkages. Cationic materials include cationic sugar and/or starch derivatives and the typical block copolymer detergent surfactants based on mixtures of polypropylene oxide and ethylene oxide are representative of the polyether materials. The polyether materials are less substantive, however.

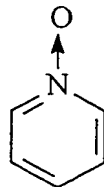
The preferred polymers comprise water soluble amine oxide moieties. It is believed that the partial positive charge of the amine oxide group can act to adhere the polymer to the surface of the surface substrate, thus allowing water to "sheet" more readily. The amine oxide moiety can also hydrogen-bond with hard surface substrates, such as ceramic tile, glass, fiberglass, porcelain enamel, linoleum, no-wax tile, and other hard surfaces commonly encountered in consumer homes. To the extent that polymer anchoring promotes better "sheeting" higher molecular materials are preferred. Increased molecular weight improves efficiency and effectiveness of the amine oxide-based polymer. The preferred polymers of this invention have one or more monomeric units containing at least one N-oxide group. At least about 10%, preferably more than about 50%, more preferably greater than about 90% of said monomers forming said polymers contain an amine oxide group. These polymers can be described by the general formula:

P(B)

wherein each P is selected from homopolymerizable and copolymerizable moieties which attach to form the polymer backbone, preferably vinyl moieties, e.g.  $\text{C}(\text{R})_2 - \text{C}(\text{R})_2$ , wherein each R is H,  $\text{C}_1 - \text{C}_{12}$  (preferably  $\text{C}_{\text{sub.1}} - \text{C}_{\text{sub.4}}$ ) alkyl(ene),  $\text{C}_6 - \text{C}_{12}$  aryl(ene) and/or B; B is a moiety selected from substituted and unsubstituted, linear and cyclic  $\text{C}_1 - \text{C}_{12}$  alkyl,  $\text{C}_1 - \text{C}_{12}$  alkylene,  $\text{C}_1 - \text{C}_{12}$  heterocyclic, aromatic  $\text{C}_6 - \text{C}_{12}$  groups and wherein at least one of said B moieties has at least one amine oxide ( $-\text{N} \rightarrow \text{O}$ ) group present; u is from a number that will provide at least about 10% monomers containing an amine oxide group to about 90%; and t is a number such that the average molecular weight of the polymer is from about 2,000 to about 500,000, preferably from about 5,000 to about 250,000, and more preferably from about 7,500 to about 200,000.

Preferred polymers useful in the cleaning component possess the unexpected property of being substantive without leaving a visible residue that would render the surface substrate

unappealing to consumers. The preferred polymers include poly(4-vinylpyridine N-oxide) polymers (PVNO), e.g. those formed by polymerization of monomers that include the following moiety:



wherein the average molecular weight of the polymer is from about 2,000 to about 500,000 preferably from about 5,000 to about 400,000, and more preferably from about 7,500 to about 300,000. In general, higher molecular weight polymers are preferred. Often, higher molecular weight polymers allow for use of lower levels of the wetting polymer, which can provide benefits in floor cleaner applications. The desirable molecular weight range of polymers useful in the present invention stands in contrast to that found in the art relating to polycarboxylate, polystyrene sulfonate, and polyether based additives which prefer molecular weights in the range of 400,000 to 1,500,000. Lower molecular weights for the preferred poly-amine oxide polymers of the present invention are due to greater difficulty in manufacturing these polymers in higher molecular weight.

The level of amine oxide polymer will normally be less than about 0.5%, preferably from about 0.005% to about 0.4%, more preferably from about 0.01% to about 0.3%, by weight of the end use composition/solution.

Some non-limiting examples of homopolymers and copolymers which can be used as water soluble polymers of the present invention are: adipic acid/dimethylaminohydroxypropyl diethylenetriamine copolymer; adipic acid/epoxypropyl diethylenetriamine copolymer; polyvinyl alcohol; methacryloyl ethyl betaine/methacrylates copolymer; ethyl acrylate/methyl methacrylate/methacrylic acid/acrylic acid copolymer; polyamine resins; and polyquaternary amine resins; poly(ethenylformamide); poly(vinylamine) hydrochloride; poly(vinyl alcohol-co-6% vinylamine); poly(vinyl alcohol-co-12% vinylamine); poly(vinyl alcohol-co-6% vinylamine hydrochloride); and poly(vinyl alcohol-co-12% vinylamine hydrochloride). Preferably, said copolymer and/or homopolymers are selected from the group consisting of adipic acid/dimethylaminohydroxypropyl diethylenetriamine copolymer; poly(vinylpyrrolidone/dimethylaminoethyl methacrylate); polyvinyl alcohol; ethyl acrylate/methyl methacrylate/methacrylic acid/acrylic acid copolymer; methacryloyl ethyl betaine/methacrylates copolymer; polyquaternary amine resins; poly(ethenylformamide); poly(vinylamine) hydrochloride; poly(vinyl alcohol-co-6% vinylamine); poly(vinyl alcohol-co-12% vinylamine); poly(vinyl alcohol-co-6% vinylamine hydrochloride); and poly(vinyl alcohol-co-12% vinylamine hydrochloride).

Polymers useful in the cleaning component of the present invention can be selected from the group consisting of copolymers of hydrophilic monomers. The polymer can be linear

random or block copolymers, and mixtures thereof. The term "hydrophilic" is used herein consistent with its standard meaning of having affinity for water. As used herein in relation to monomer units and polymeric materials, including the copolymers, "hydrophilic" means substantially water soluble. In this regard, "substantially water soluble" shall refer to a material that is soluble in distilled (or equivalent) water, at 25°C, at a concentration of about 0.2% by weight, and are preferably soluble at about 1% by weight. The terms "soluble", "solubility" and the like, for purposes hereof, correspond to the maximum concentration of monomer or polymer, as applicable, that can dissolve in water or other solvents to form a homogeneous solution, as is well understood to those skilled in the art.

Nonlimiting examples of useful hydrophilic monomers are unsaturated organic mono- and polycarboxylic acids, such as acrylic acid, methacrylic acid, crotonic acid, maleic acid and its half esters, itaconic acid; unsaturated alcohols, such as vinyl alcohol, allyl alcohol; polar vinyl heterocyclics, such as, vinyl caprolactam, vinyl pyridine, vinyl imidazole; vinyl amine; vinyl sulfonate; unsaturated amides, such as acrylamides, e.g., N,N-dimethylacrylamide, N-t-butyl acrylamide; hydroxyethyl methacrylate; dimethylaminoethyl methacrylate; salts of acids and amines listed above; and the like; and mixtures thereof. Some preferred hydrophilic monomers are acrylic acid, methacrylic acid, N,N-dimethyl acrylamide, N,N-dimethyl methacrylamide, N-t-butyl acrylamide, dimethylamino ethyl methacrylate, thereof, and mixtures thereof.

Polycarboxylate polymers are those formed by polymerization of monomers, at least some of which contain carboxylic functionality. Common monomers include acrylic acid, maleic acid, ethylene, vinyl pyrrolidone, methacrylic acid, methacryloylethylbetaine, etc. Preferred polymers for substantivity are those having higher molecular weights. For example, polyacrylic acid having molecular weights below about 10,000 are not particularly substantive and therefore do not normally provide hydrophilicity for three rewettings with all compositions, although with higher levels and/or certain surfactants like amphoteric and/or zwitterionic detergent surfactants, molecular weights down to about 1000 can provide some results. In general, the polymers should have molecular weights of more than about 10,000, preferably more than about 20,000, more preferably more than about 300,000, and even more preferably more than about 400,000. It has also been found that higher molecular weight polymers, e.g., those having molecular weights of more than about 3,000,000, are extremely difficult to formulate and are less effective in providing anti-spotting benefits than lower molecular weight polymers. Accordingly, the molecular weight should normally be, especially for polyacrylates, from about 20,000 to about 3,000,000; preferably from about 20,000 to about 2,500,000; more preferably from about 300,000 to about 2,000,000; and even more preferably from about 400,000 to about 1,500,000.

An advantage for some polycarboxylate polymers is the detergent builder effectiveness of such polymers. Although such polymers do hurt filming/streaking, like other detergent builders,

they provide increased cleaning effectiveness on typical, common "hard-to-remove" soils that contain particulate matter.

Some polymers, especially polycarboxylate polymers, thicken the compositions that are aqueous liquids. This can be desirable. However, when the compositions are placed in containers with trigger spray devices, the compositions are desirably not so thick as to require excessive trigger pressure. Typically, the viscosity under shear should be less than about 200 cp, preferably less than about 100 cp, more preferably less than about 50 cp. It can be desirable, however, to have thick compositions to inhibit the flow of the composition off the surface, especially vertical surfaces.

Non limiting examples of polymers for use in the present invention include the following: poly(vinyl pyrrolidone/acrylic acid) sold under the name "Acrylidone"® by ISP and poly(acrylic acid) sold under the name "Accumer"® by Rohm & Haas. Other suitable materials include sulfonated polystyrene polymers sold under the name Versaflex® sold by National Starch and Chemical Company, especially Versaflex 7000.

The level of polymeric material will normally be less than about 0.5%, preferably from about 0.01% to about 0.4%, more preferably from about 0.01% to about 0.3%. In general, lower molecular weight materials such as lower molecular weight poly(acrylic acid), e.g., those having molecular weights below about 10,000, and especially about 2,000, do not provide good anti-spotting benefits upon rewetting, especially at the lower levels, e.g., about 0.02%. One should use only the more effective materials at the lower levels. In order to use lower molecular weight materials, substantivity should be increased, e.g., by adding groups that provide improved attachment to the surface, such as cationic groups, or the materials should be used at higher levels, e.g., more than about 0.05%.

Preferred polymers in the cleaning component are selected from the group consisting of polystyrene sulfonate; polyvinyl pyrrolidone; polyvinyl pyrrolidone acrylic acid copolymer; polyvinyl pyrrolidone acrylic acid copolymer sodium salt; polyvinyl pyrrolidone acrylic acid copolymer potassium salt; polyvinyl pyrrolidone- vinyl imidazoline; polyvinyl pyridine; polyvinyl pyridine n-oxide; and combinations thereof. A preferred polymer is polyvinyl pyridine n-oxide.

Another embodiment of the cleaning component comprises an effective amount of a detergent surfactant rather than the above-described polymer. Suitable detergent surfactants would include those lathering discussed above as suitable for inclusion in the cleansing component.

Preferred surfactants for use herein are the alkylpolysaccharides that are disclosed in U.S. Patents: 5,776,872, issued July 7, 1998, to Giret, et al.; 5,883,059, issued March 16, 1999, to Furman et al.; 5,883,062, issued March 16, 1999, to Addison et al.; and 5,906,973, issued May 25, 1999, to Ouzounis et al..

Suitable alkylpolysaccharides for use herein are disclosed in U.S. Pat. No. 4,565,647, Llenado, issued Jan. 21, 1986, having a hydrophobic group containing from about 6 to about 30

carbon atoms, preferably from about 10 to about 16 carbon atoms and a polysaccharide, e.g., a polyglycoside, hydrophilic group. For acidic or alkaline cleaning compositions/solutions suitable for use in no-rinse methods, the preferred alkyl polysaccharide preferably comprises a broad distribution of chain lengths, as these provide the best combination of wetting, cleaning, and low residue upon drying. This "broad distribution" is defined by at least about 50% of the chainlength mixture comprising from about 10 carbon atoms to about 16 carbon atoms. Preferably, the alkyl group of the alkyl polysaccharide consists of a mixtures of chainlength, preferably from about 6 to about 18 carbon atoms, more preferably from about 8 to about 16 carbon atoms, and hydrophilic group containing from about one to about 1.5 saccharide, preferably glucoside, groups per molecule. This "broad chainlength distribution" is defined by at least about 50% of the chainlength mixture comprising from about 10 carbon atoms to about 16 carbon atoms. A broad mixture of chain lengths, particularly C<sub>8</sub>-C<sub>16</sub>, is highly desirable relative to narrower range chain length mixtures, and particularly versus lower (i.e., C<sub>8</sub>-C<sub>10</sub> or C<sub>8</sub>-C<sub>12</sub>) chainlength alkyl polyglucoside mixtures. It is also found that the preferred C<sub>8-16</sub> alkyl polyglucoside provides much improved perfume solubility versus lower and narrower chainlength alkyl polyglucosides, as well as other preferred surfactants, including the C<sub>8</sub>-C<sub>14</sub> alkyl ethoxylates. Any reducing saccharide containing 5 or 6 carbon atoms can be used, e.g., glucose, galactose and galactosyl moieties can be substituted for the glucosyl moieties. (optionally the hydrophobic group is attached at the 2-, 3-, 4-, etc. positions thus giving a glucose or galactose as opposed to a glucoside or galactoside.) The intersaccharide bonds can be, e.g., between the one position of the additional saccharide units and the 2-, 3-, 4-, and/or 6-positions on the preceding saccharide units. The glycosyl is preferably derived from glucose.

Optionally, and less desirably, there can be a polyalkyleneoxide chain joining the hydrophobic moiety and the polysaccharide moiety. The preferred alkyleneoxide is ethylene oxide. Typical hydrophobic groups include alkyl groups, either saturated or unsaturated, branched or unbranched containing from 8 to 18, preferably from 10 to 16, carbon atoms. Preferably, the alkyl group is a straight-chain saturated alkyl group. The alkyl group can contain up to about 3 hydroxyl groups and/or the polyalkyleneoxide chain can contain up to about 10, preferably less than 5, alkyleneoxide moieties. Suitable alkyl polysaccharides are octyl, nonyldecyl, undecyldodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, and octadecyl, di-, tri-, tetra-, penta-, and hexaglucoisdes and/ or galatoses. Suitable mixtures include coconut alkyl, di-, tri-, tetra-, and pentaglucoisdes and tallow alkyl tetra-, penta- and hexaglucoisdes.

To prepare these compounds, the alcohol or alkylpolyethoxy alcohol is formed first and then reacted with glucose, or a source of glucose, to form the glucoside (attachment at the 1-position). The additional glycosyl units can then be attached between their 1-position and the preceding glycosyl units 2-,3-, 4- and/or 6-position, preferably predominantly the 2-position.

In the alkyl polyglycosides, the alkyl moieties can be derived from the usual sources like fats, oils or chemically produced alcohols while their sugar moieties are created from

hydrolyzed polysaccharides. Alkyl polyglycosides are the condensation product of fatty alcohol and sugars like glucose with the number of glucose units defining the relative hydrophilicity. As discussed above, the sugar units can additionally be alkoxylated either before or after reaction with the fatty alcohols. Such alkyl polyglycosides are described in detail in WO 86/05199 for example. Technical alkyl polyglycosides are generally not molecularly uniform products, but represent mixtures of alkyl groups and mixtures of monosaccharides and different oligosaccharides. Alkyl polyglycosides (also sometimes referred to as "APG's") are preferred for the purposes of the invention since they provide additional improvement in surface appearance relative to other surfactants. The glycoside moieties are preferably glucose moieties. The alkyl substituent is preferably a saturated or unsaturated alkyl moiety containing from about 8 to about 18 carbon atoms, preferably from about 8 to about 10 carbon atoms or a mixture of such alkyl moieties. C<sub>8</sub>-C<sub>16</sub> alkyl polyglucosides are commercially available (e.g., Simusol® surfactants from Seppic Corporation, 75 Quai d'Orsay, 75321 Paris, Cedex 7, France, and Glucopon®425 available from Henkel. However, it has been found that purity of the alkyl polyglucoside can also impact performance, particularly end result for certain applications, including daily shower product technology. In the present invention, the preferred alkyl polyglucosides are those which have been purified enough for use in personal cleansing. Most preferred are "cosmetic grade" alkyl polyglucosides, particularly C<sub>8</sub> to C<sub>16</sub> alkyl polyglucosides, such as Plantaren 2000®, Plantaren 2000 N®, and Plantaren 2000 N UP®, available from Henkel Corporation (Postfach 101100, D 40191 Dusseldorf, Germany). Therefore, such surfactants would also be preferred for use in the cleansing component when the article is used for personal care applications.

In the context of floor, counter, wall, etc. applications, another class of preferred nonionic surfactant is alkyl ethoxylates. The alkyl ethoxylates of the present invention are either linear or branched, and contain from about 8 carbon atoms to about 14 carbon atoms, and from about 4 ethylene oxide units to about 25 ethylene oxide units. Examples of alkyl ethoxylates include Neodol® 91-6, Neodol 91-8® supplied by the Shell Corporation (P.O. Box 2463, 1 Shell Plaza, Houston, Texas), and Alfonic® 810-60 supplied by Vista Corporation, (900 Threadneedle P.O. Box 19029, Houston, TX). More preferred surfactants are the alkyl ethoxylates comprising from about 9 to about 12 carbon atoms, and from about 4 to about 8 ethylene oxide units. These surfactants offer excellent cleaning benefits and work synergistically with the required hydrophilic polymers. A most preferred alkyl ethoxylate is C<sub>11</sub>EO<sub>5</sub>, available from the Shell Chemical Company under the trademark Neodol® 1-5. This surfactant is found to provide desirable wetting and cleaning properties, and can be advantageously combined with the preferred C<sub>8-16</sub> alkyl polyglucoside in a matrix that includes the wetting polymers of the present invention. While not wishing to be limited by theory, it is believed that the C<sub>8-16</sub> alkyl polyglucoside can provide a superior end result (i.e., reduce hazing) in compositions that additionally contain the preferred alkyl ethoxylate particularly when the preferred alkyl

ethoxylate is required for superior cleaning. The preferred the  $C_{8-16}$  alkyl polyglucoside is also found to improve perfume solubility of compositions comprising alkyl ethoxylates. Higher levels of perfume can be advantageous for consumer acceptance.

More preferred detergent surfactants are selected from the group consisting of alkyl polysaccharide detergent surfactant having an alkyl group containing from about 8 to about 18 carbon atoms, more preferably from about 8 to about 16 carbon atoms, and from about one to about four, preferably from about one to about 1.5 saccharide moieties per molecule and/or a combination consisting of alkyl polysaccharide detergent surfactants having an alkyl group containing from about 8 to about 18 carbon atoms, more preferably from about 8 to about 16 carbon atoms, and from about one to about four, preferably from about one to about 1.5 saccharide moieties per molecule together with an alkyl ethoxylate comprising from about 8 to about 16 carbon atoms and from about 4 to about 25 oxyethylene units, and combinations thereof.

The liquid cleaning components according to the present invention are prepared with relatively low levels of active. Typically, such cleaning components will comprise sufficient surfactant and optional solvent, as discussed hereinafter, to be effective as hard surface cleaners yet remain economical; accordingly they typically contain from about 0.005% to about 0.5% by weight of the composition of surfactant, preferably alkylpolyglycoside and/or  $C_{8-14}$  alkylethoxylate surfactant, more preferably from about 0.01% to about 0.4% surfactant, and even more preferably from about 0.01% to about 0.3% surfactant. It has been found that use of low, rather than high levels of surfactant are advantageous to overall end result performance. It is also been found that when the primary surfactant system includes preferred alkyl ethoxylates that end result hazing is mitigated by specific cosurfactants. Preferred cosurfactants are  $C_8$  sulfonate and Poly-Tergent CS-1.

In the household care area, the articles of the present invention may be particularly useful. For instance, the articles may be used for in-dryer cleaning and/or refreshing articles of clothing when placed inside a containment bag along with such clothing wherein the containment bag is then placed into a dryer. In this context, the articles of the present invention may be either substantially dry or substantially wet. Preferably, articles of the present invention suitable for in-dryer cleaning comprise water and a member selected from the group consisting of surfactants, perfumes, preservatives, bleaches, auxiliary cleaning agents, organic solvents and mixtures thereof. The preferred organic solvents are glycol ethers, specifically, methoxy propoxy propanol, ethoxy propoxy propanol, propoxy propoxy propanol, butoxy propoxy propanol, butoxy propanol and mixtures thereof. The surfactant is preferably a nonionic surfactant, such as an ethoxylated alcohol or ethoxylated alkyl phenol, and is present at up to about 2%, by weight of the cleaning/refreshment composition. Typical cleaning components suitable for fabric cleaning herein can comprise at least about 80%, by weight, water, preferably at least about 90%, and more preferably at least about 95% water.

Suitable organic solvents, surfactants, perfumes, preservatives, bleaches and auxiliary cleaning agents that can be contained in the cleaning component of the present invention can be found in U.S. Patent No. 5,789,368, which issued on August 4, 1998 to You et al. and in U.S. Patent No. 5,591,236, which issued on January 7, 1997 to Roetker. The entire disclosure of the You et al. and the Roetker patents are incorporated herein by reference. Additionally, co-pending U.S. Patent Application No. 08/789,171, which was filed on January 24, 1997, in the name of Trinh et al. describes additional compositions which would be suitable cleaning components. The entire disclosure of the Trinh et al. Application is incorporated herein by reference.

In the fabric cleaning/refreshing context, it is preferred that the cleaning component of this invention include a shrinkage reducing composition, which is preferably selected from the group consisting of ethylene glycol, all isomers of propanediol, butanediol, pentanediol, hexanediol and mixtures thereof, and more preferably selected from the group consisting of neopentyl glycol, polyethylene glycol, 1,2-propanediol, 1,3-butanediol, 1-octanol and mixtures thereof. The shrinkage reducing composition is preferably neopentyl glycol or 1,2-propanediol, and is more preferably 1,2-propanediol. The ratio of shrinkage reducing composition to cleaning component is preferably from about 1:2 to about 1:5, preferably from about 1:2 to about 1:4, more preferably from about 1:3 to about 1:4, and most preferably about 1:3.6.

In addition to the above ingredients, the cleaning component may optionally comprise a bleaching agent, preferably hydrogen peroxide.

#### Polishing/Dusting Component

The benefit component of the presently disclosed articles may be a polishing/dusting component. The polishing/dusting performance of any of the articles of the present invention can be further enhanced by treating the fibers of the sheet, especially surface treating, with any polishing/dusting component that enhances adherence of soils to the article. When utilized, such polishing/dusting components are added to the article at a level sufficient to enhance the ability of the article to adhere soils. However, the level and type of additive must be selected to minimize the amount of residue left on the surface to be polished or dusted so that the surface is visually acceptable to consumers. Such additives are preferably applied to the article at an add-on level of at least about 0.01%, more preferably at least about 0.1%, more preferably at least about 0.5%, more preferably at least about 1%, still more preferably at least about 3%, still more preferably at least about 4%, by weight. Typically, the add-on level is from about 0.1 to about 25%, more preferably from about 0.5 to about 20%, more preferably from about 1 to about 15%, still more preferably from about 2 to about 10%, still more preferably from about 4 to about 8%, and most preferably from about 4 to about 6%, by weight of the article.

A preferred polishing/dusting component comprises a material selected from the group consisting of a wax, oil, and combinations thereof. Suitable waxes include various types of hydrocarbons, as well as esters of certain fatty acids (e.g., saturated triglycerides) and fatty alcohols. They can be derived from natural sources (i.e., animal, vegetable or mineral) or can be

synthesized. Mixtures of these various waxes can also be used. Some representative animal and vegetable waxes that can be used in the present invention include beeswax, carnauba, spermaceti, lanolin, shellac wax, candelilla, and the like. Representative waxes from mineral sources that can be used in the present invention include petroleum-based waxes such as paraffin, petrolatum and microcrystalline wax, and fossil or earth waxes such as white ceresine wax, yellow ceresine wax, white ozokerite wax, and the like. Representative synthetic waxes that can be used in the present invention include ethylenic polymers such as polyethylene wax, chlorinated naphthalenes such as "Halowax," hydrocarbon type waxes made by Fischer-Tropsch synthesis, and the like. Other preferred polishing/dusting components are supplied as mixtures of wax and oil, such as petrolatum.

A preferred polishing/dusting component comprises a mixture of a wax and mineral oil, as it enhances the ability of the article to pick up and retain particulate material from surfaces, while minimizing the amount of residue left on the surface being wiped with the article. When a mixture of mineral oil and wax is utilized, the components will preferably be mixed in a ratio of oil to wax of from about 1:99 to about 7:3, more preferably from about 1:99 to about 3:2, still more preferably from about 1:99 to about 2:3, by weight. In a particularly preferred embodiment, the ratio of oil to wax is about 1:1, by weight, and the additive is applied at an add-on level of about 5%, by weight. A preferred mixture for the polishing/dusting component is a 1:1 mixture of mineral oil and paraffin wax.

Wax alone, such as paraffin wax, can be utilized as a polishing/dusting component in the present articles. Where a wax is the only polishing/dusting component, the articles are preferably comprised of synthetic fibers, so that the article is still able to maintain electrostatic properties to provide enhanced particulate material pick-up and retention. In any event, if the laminate web of the article comprises natural and/or synthetic fibers, a polishing/dusting component that consists essentially of wax is typically applied to the laminate web at an add-on level of no greater than about 4%, preferably no greater than about 3%, more preferably no greater than about 2%, and even more preferably no greater than about 1%, by weight of the article. These levels are preferred because if a wax is applied to the laminate web at higher levels, the electrostatic properties of the article will typically be diminished, and therefore decrease the overall dusting/polishing performance of the article.

Mineral oil alone can also be utilized as a polishing/dusting component in the present articles. A polishing/dusting component consisting essentially of mineral oil is typically applied to the laminate web at an add-on level of no greater than about 4%, preferably no greater than about 3%, more preferably no greater than about 2%, and even more preferably no greater than about 1%, by weight of the article.

These low levels are especially desirable when additives are applied at an effective level and preferably in a substantially uniform way to at least one discrete continuous area of the article. Use of the preferred lower levels, especially of polishing/dusting component that improve adherence of soil to the article, provides dust suppression in the air, preferred consumer

impressions, especially tactile impressions, and, in addition, the polishing/dusting component can provide a means for incorporating and attaching perfumes, pest control ingredients, antimicrobials, including fungicides, and a host of other beneficial ingredients, especially those that are soluble, or dispersible, in the additive. These benefits are by way of example only.

Preferably, the polishing/dusting component does not significantly diminish the electrostatic properties of the article when it is being used for polishing and/or dust removal. It is preferable that the article of the present invention have electrostatic properties when used in this context in order to facilitate pick-up and retention of particulate material, especially for fine dust particulate material.

The polishing/dusting component can be applied to the present articles via a variety of application methods. Such methods include manual rolling, mechanical rolling, slotting, ultrasonic spraying, pressurized spraying, pump spraying, dipping, and the like. A preferred method of application of the polishing/dusting component to the article is by ultrasonic spraying. The polishing/dusting component is preferably uniformly sprayed onto the laminate web of the article.

Another preferred method of application of the polishing/dusting component to the article is by mechanical rolling. During the process of making the articles, they are fed through a set of rollers that are coated with the polishing/dusting component to be applied. The rollers can be coated with the polishing/dusting component by rotating in a pan or reservoir containing the component. As the articles are fed through the rollers, the component is transferred from the rollers to the articles. If the polishing/dusting component is a mixture of a wax and mineral oil, particularly in a ratio of wax to mineral oil of 1:1, the pan or reservoir containing the polishing/dusting component is preferably heated to a temperature of from about 32°C to about 98°C, preferably from about 40°C to about 65°C, in order to maintain the polishing/dusting component in a fluid state. In such a situation, the rollers are also preferably heated to a temperature similar to the temperature of the hot component in a fluid state. Typically, the temperature of the component mixture and the rollers are maintained at least about 5°C to about 10°C greater than the melting point of the component mixture.

For small scale production of the present articles, the component can also be applied to the article via manual rolling, which comprises taking a hand-held roller, coating the roller with component, and rolling the roller across the surface of the article.

#### Moisture Retention Methodology

As described above, in certain embodiments, the articles of the present invention are considered to be "substantially dry". As used herein, "substantially dry" means that the articles of the present invention exhibit a Moisture Retention of less than about 0.95 gms, preferably less than about 0.75 gms, even more preferably, less than about 0.5 gms, even more preferably less than about 0.25 gms, even still more preferably less than about 0.15 gms, and most preferably, less than about 0.1 gms. The Moisture Retention is indicative of the dry feel that users perceive upon touching certain articles of the present invention as opposed to the feel of "wet" wipes.

On the other hand, there are articles of the present invention that are "substantially wet." As used herein, "substantially wet" means that the articles feel wet to the touch of a consumer. That is, such articles exhibit a Moisture Retention of greater than about 0.95 gms.

In order to determine the Moisture Retention of the present articles and other disposable substrate-based products, the following equipment and materials are needed.

Bounty White Paper Towel	Procter & Gamble SKU 37000 63037 Basis Weight = 42.14gsm
Balance	Accurate to 0.0g
Lexan	0.5" thickness large enough to cover samples completely and weighs 1000g
Weight	A 2000g weight or combination to equal 2000g

Next, weigh two paper towels separately and record each weight. Place one paper towel on flat surface (e.g. lab bench). Place the sample article on top of that towel. Place the other paper towel on top of sample article. Next, place the Lexan and then the 2000g weight(s) on top of the sandwiched sample article. Wait 1 minute. After the minute, remove weight(s) and Lexan. Weigh the top and bottom paper towel and record the weight.

Calculate the Moisture Retention by subtracting the initial paper towel weight from the final weight (after 1 minute) for both the top and bottom paper towels. Add the weight differences obtained for the top and bottom paper towels. Assuming multiple articles are tested, average the total weight differences to obtain the Moisture Retention.

#### OPTIONAL INGREDIENTS SUITABLE FOR INCLUSION INTO PERSONAL CARE ARTICLES OF THE PRESENT INVENTION

The articles of the present invention that are suitable for personal care applications may contain a variety of other components such as are conventionally used in a given product type provided that they do not unacceptably alter the benefits of the invention. These optional components should be suitable for application to human skin and hair, that is, when incorporated into the article they are suitable for use in contact with human skin without undue toxicity, incompatibility, instability, allergic response, and the like, within the scope of sound medical or formulator's judgment. The *CTFA Cosmetic Ingredient Handbook*, Second Edition (1992) describes a wide variety of nonlimiting cosmetic and pharmaceutical ingredients commonly used in the skin care industry, which are suitable for use in the articles of the present invention.

In the personal care area, examples of suitable optional ingredient classes include: enzymes, abrasives, skin exfoliating agents, absorbents, aesthetic components such as fragrances, pigments, colorings/colorants, essential oils, skin sensates, astringents, etc. (e.g., clove oil, menthol, camphor, eucalyptus oil, eugenol, menthyl lactate, witch hazel distillate), anti-acne agents (e.g., resorcinol, sulfur, salicylic acid, erythromycin, zinc, etc.), anti-caking agents, antifoaming agents, additional antimicrobial agents (e.g., iodopropyl butylcarbamate),

antioxidants, binders, biological additives, buffering agents, bulking agents, chelating agents, chemical additives, colorants, cosmetic astringents, cosmetic biocides, denaturants, drug astringents, external analgesics, film formers or materials, e.g., polymers, for aiding the film-forming properties and substantivity of the composition (e.g., copolymer of eicosene and vinyl pyrrolidone), humectants, opacifying agents, pH adjusters, propellants, reducing agents, sequestrants, skin bleaching agents (or lightening agents) (e.g., hydroquinone, kojic acid, ascorbic acid, magnesium ascorbyl phosphate, ascorbyl glucosamine), skin soothing and/or healing agents (e.g., panthenol and derivatives (e.g., ethyl panthenol), aloe vera, pantothenic acid and its derivatives, allantoin, bisabolol, and dipotassium glycyrrhizinate), skin treating agents, including agents for preventing, retarding, arresting, and/or reversing skin wrinkles (e.g., alpha-hydroxy acids such as lactic acid and glycolic acid and beta-hydroxy acids such as salicylic acid), thickeners, hydrocolloids, particular zeolites, and vitamins and derivatives thereof (e.g. tocopherol, tocopherol sorbate, tocopherol acetate, beta carotene, retinoic acid, retinol, retinoids, retinyl palmitate, niacin, niacinamide, and the like). The articles of the present invention may include carrier components such as are known in the art. Such carriers can include one or more compatible liquid or solid filler diluents or vehicles which are suitable for application to skin or hair.

The articles of the present invention may optionally contain one or more of such optional components. Preferred articles of the present invention which are suitable for personal care use optionally contain a safe and effective amount of therapeutic benefit component comprising a therapeutic benefit agent selected from the group consisting of vitamin compounds, skin treating agents, anti-acne actives, anti-wrinkle actives, anti-skin atrophy actives, anti-inflammatory actives, topical anesthetics, artificial tanning actives and accelerators, anti-microbial actives, anti-fungal actives, sunscreen actives, anti-oxidants, skin exfoliating agents, and combinations thereof. As used herein, "a safe and effective amount" means an amount of a compound or component sufficient to significantly induce a positive effect or benefit, but low enough to avoid serious side effects, (e.g., undue toxicity or allergic reaction), i.e., to provide a reasonable benefit to risk ratio, within the scope of sound medical judgment.

The optional components useful herein can be categorized by their therapeutic or aesthetic benefit or their postulated mode of action. However, it is to be understood that the optional components useful herein can in some instances provide more than one therapeutic or aesthetic benefit or operate via more than one mode of action. Therefore, classifications herein are made for the sake of convenience and are not intended to limit the component to that particular application or applications listed. Also, when applicable, the pharmaceutically-acceptable salts of the components are useful herein.

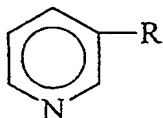
#### Vitamin Compounds

The present articles may comprise vitamin compounds, precursors, and derivatives thereof. These vitamin compounds may be in either natural or synthetic form. Suitable vitamin compounds include, but are not limited to, Vitamin A (e.g., beta carotene, retinoic acid, retinol,

retinoids, retinyl palmitate, retinyl propionate, etc.), Vitamin B (e.g., niacin, niacinamide, riboflavin, pantothenic acid, etc.), Vitamin C (e.g., ascorbic acid, etc.), Vitamin D (e.g., ergosterol, ergocalciferol, cholecalciferol, etc.), Vitamin E (e.g., tocopherol acetate, etc.), and Vitamin K (e.g., phytonadione, menadione, phthiocol, etc.) compounds.

In particular, the articles of the present invention may comprise a safe and effective amount of a vitamin B<sub>3</sub> compound. Vitamin B<sub>3</sub> compounds are particularly useful for regulating skin condition as described in co-pending U. S. Application Serial No. 08/834,010, filed April 11, 1997 (corresponding to international publication WO 97/39733 A1, published October 30, 1997) which is incorporated by reference herein in its entirety. The therapeutic component of the present invention preferably comprise from about 0.01% to about 50%, more preferably from about 0.1% to about 10%, even more preferably from about 0.5% to about 10%, and still more preferably from about 1% to about 5%, most preferably from about 2% to about 5%, of the vitamin B<sub>3</sub> compound.

As used herein, "vitamin B<sub>3</sub> compound" means a compound having the formula:



wherein R is - CONH<sub>2</sub> (i.e., niacinamide), - COOH (i.e., nicotinic acid) or - CH<sub>2</sub>OH (i.e., nicotinyl alcohol); derivatives thereof; and salts of any of the foregoing.

Exemplary derivatives of the foregoing vitamin B<sub>3</sub> compounds include nicotinic acid esters, including non-vasodilating esters of nicotinic acid, nicotinyl amino acids, nicotinyl alcohol esters of carboxylic acids, nicotinic acid N-oxide and niacinamide N-oxide.

Examples of suitable vitamin B<sub>3</sub> compounds are well known in the art and are commercially available from a number of sources, e.g., the Sigma Chemical Company (St. Louis, MO); ICN Biomedicals, Inc. (Irvin, CA) and Aldrich Chemical Company (Milwaukee, WI).

The vitamin compounds may be included as the substantially pure material, or as an extract obtained by suitable physical and/or chemical isolation from natural (e.g., plant) sources.

#### Skin Treating Agents

The articles of the present invention may contain one or more skin treating agents. Suitable skin treating agents include those effective for preventing, retarding, arresting, and/or reversing skin wrinkles. Examples of suitable skin treating agents include, but are not limited to, alpha-hydroxy acids such as lactic acid and glycolic acid and beta-hydroxy acids such as salicylic acid.

#### Anti-Acne Actives

Examples of useful anti-acne actives for the articles of the present invention include, but are not limited to, the keratolytics such as salicylic acid (o-hydroxybenzoic acid), derivatives of

salicylic acid such as 5-octanoyl salicylic acid, and resorcinol; retinoids such as retinoic acid and its derivatives (e.g., cis and trans); sulfur-containing D and L amino acids and their derivatives and salts, particularly their N-acetyl derivatives, a preferred example of which is N-acetyl-L-cysteine; lipoic acid; antibiotics and antimicrobials such as benzoyl peroxide, octopirox, tetracycline, 2,4,4'-trichloro-2'-hydroxy diphenyl ether, 3,4,4'-trichlorobanilide, azelaic acid and its derivatives, phenoxyethanol, phenoxypropanol, phenoxyisopropanol, ethyl acetate, clindamycin and meclizine; seboestats such as flavonoids; and bile salts such as scymnol sulfate and its derivatives, deoxycholate, and cholate.

#### Anti-Wrinkle and Anti-Skin Atrophy Actives

Examples of anti-wrinkle and anti-skin atrophy actives useful for the articles of the present invention include, but are not limited to, retinoic acid and its derivatives (e.g., cis and trans); retinol; retinyl esters; niacinamide, salicylic acid and derivatives thereof; sulfur-containing D and L amino acids and their derivatives and salts, particularly the N-acetyl derivatives, a preferred example of which is N-acetyl-L-cysteine; thiols, e.g., ethane thiol; terpene alcohols (e.g., farnesol); hydroxy acids, phytic acid, lipoic acid; lysophosphatidic acid, and skin peel agents (e.g., phenol and the like).

#### Non-Steroidal Anti-Inflammatory Actives (NSAIDS)

Examples of NSAIDS useful for the articles of the present invention include, but are not limited to, the following categories: propionic acid derivatives; acetic acid derivatives; fenamic acid derivatives; biphenylcarboxylic acid derivatives; and oxicams. All of these NSAIDS are fully described in U. S. Patent 4,985,459 to Sunshine et al., issued January 15, 1991, incorporated by reference herein in its entirety. Examples of useful NSAIDS include acetyl salicylic acid, ibuprofen, naproxen, benoxaprofen, flurbiprofen, fenoprofen, fenbufen, ketoprofen, indoprofen, piroxicam, carprofen, oxaprozin, pranoprofen, miroprofen, tioxaprofen, suprofen, alminoprofen, tiaprofenic acid, fluprofen and bucloxic acid. Also useful are the steroidal anti-inflammatory drugs including hydrocortisone and the like.

#### Topical Anesthetics

Examples of topical anesthetic drugs useful for the articles of the present invention include, but are not limited to, benzocaine, lidocaine, bupivacaine, chlorprocaine, dibucaine, etidocaine, mepivacaine, tetracaine, dyclonine, hexylcaine, procaine, cocaine, ketamine, pramoxine, phenol, and pharmaceutically acceptable salts thereof.

#### Artificial Tanning Actives and Accelerators

Examples of artificial tanning actives and accelerators useful for the articles of the present invention include, but are not limited to, dihydroxyacetone, tyrosine, tyrosine esters such as ethyl tyrosinate, and phospho-DOPA.

#### Antimicrobial and Antifungal Actives

Examples of antimicrobial and antifungal actives useful for the articles of the present invention include, but are not limited to,  $\beta$ -lactam drugs, quinolone drugs, ciprofloxacin, norfloxacin, tetracycline, erythromycin, amikacin, 2,4,4'-trichloro-2'-hydroxy diphenyl ether,

3,4,4'-trichlorocaranilide, phenoxyethanol, phenoxy propanol, phenoxyisopropanol, doxycycline, capreomycin, chlorhexidine, chlortetracycline, oxytetracycline, clindamycin, ethambutol, hexamidine isethionate, metronidazole, pentamidine, gentamicin, kanamycin, lineomycin, methacycline, methenamine, minocycline, neomycin, netilmicin, paromomycin, streptomycin, tobramycin, miconazole, tetracycline hydrochloride, erythromycin, zinc erythromycin, erythromycin estolate, erythromycin stearate, amikacin sulfate, doxycycline hydrochloride, capreomycin sulfate, chlorhexidine gluconate, chlorhexidine hydrochloride, chlortetracycline hydrochloride, oxytetracycline hydrochloride, clindamycin hydrochloride, ethambutol hydrochloride, metronidazole hydrochloride, pentamidine hydrochloride, gentamicin sulfate, kanamycin sulfate, lineomycin hydrochloride, methacycline hydrochloride, methenamine hippurate, methenamine mandelate, minocycline hydrochloride, neomycin sulfate, netilmicin sulfate, paromomycin sulfate, streptomycin sulfate, tobramycin sulfate, miconazole hydrochloride, amantadine hydrochloride, amantadine sulfate, octopirox, parachlorometa xyleneol, nystatin, tolnaftate, zinc pyrithione and clotrimazole.

#### Anti-viral Agents

The articles of the present invention may further comprise one or more anti-viral agents. Suitable anti-viral agents include, but are not limited to, metal salts (e.g., silver nitrate, copper sulfate, iron chloride, etc.) and organic acids (e.g., malic acid, salicylic acid, succinic acid, benzoic acid, etc.). In particular compositions which contain additional suitable anti-viral agents include those described in copending U. S. patent applications Serial Nos. 09/421,084 (Beerse et al.) ; 09/421,131 (Biedermann et al.); 09/420,646 (Morgan et al.); and 09/421,179 (Page et al.), which were each filed on October 19, 1999.

#### Enzymes

The article of the present invention may optionally include one or more enzymes. Preferably, such enzymes are dermatologically acceptable. Suitable enzymes include, but are not limited to, keratinase, protease, amylase, subtilisin, other peptides, etc..

Peptides, including but not limited to, di-, tri-, tetra-, and pentapeptides and derivatives thereof, may be included in the components of the present invention in amounts that are safe and effective. As used herein, "peptides" refers to both the naturally occurring peptides and synthesized peptides. Also useful herein are naturally occurring and commercially available compositions that contain peptides.

Suitable dipeptides for use herein include Carnosine (beta-ala-his). Suitable tripeptides for use herein include, gly-his-lys, arg-lys-arg, his-gly-gly. Preferred tripeptides and derivatives thereof include palmitoyl-gly-his-lys which may be purchased as Biopeptide CL® (100ppm of palmitoyl-gly-his-lys commercially available from Sederma, France); Peptide CK (arg-lys-arg); Peptide CK+ (ac-arg-lys-arg-NH<sub>2</sub>); and a copper derivative of his-gly-gly sold commercially as Iamin, from Sigma (St. Louis, Missouri). Suitable tetrapeptides for use herein include Peptide E, arg-ser-arg-lys (SEQ ID NO:1). Suitable pentapeptides for use herein include lys-thr-thr-lys-ser. A preferred commercially available pentapeptide derivative composition is Matrixyl®,

which contains 100 ppm palmitoyl-lys-thr-thr-lys-ser (SEQ ID NO:2, commercially available from Sederma, France).

Preferably, the peptide is selected from palmitoyl-lys-thr-thr-lys-ser, palmitoyl-gly-his-lys, beta-ala-his, their derivatives, and combinations thereof. More preferably, the peptide is selected from palmitoyl-lys-thr-thr-lys-ser, palmitoyl-gly-his-lys, their derivatives, and combinations thereof. Even more preferably, the peptide is selected from palmitoyl-lys-thr-thr-lys-ser and derivatives thereof.

When included in the present components, peptides are preferably included in amounts of from about  $1 \times 10^{-6}\%$  to about 10%, more preferably from about  $1 \times 10^{-6}\%$  to about 0.1%, even more preferably from about  $1 \times 10^{-5}\%$  to about 0.01%, by weight of the component. In certain components where the peptide is Carnosine®, the components preferably contain from about 0.1% to about 5%, by weight of the component, of such peptides. In other embodiments wherein the peptide-containing components Matrixyl® and/or Biopeptide CL® are included, the components preferably contain from about 0.1% to about 10%, by weight component, of Matrixyl® and/or Biopeptide CL® peptide-containing compositions.

#### Sunscreen Actives

Also useful herein are sunscreens. A wide variety of sunscreens are described in U.S. Patent No. 5,087,445, to Haffey et al., issued February 11, 1992; U.S. Patent No. 5,073,372, to Turner et al., issued December 17, 1991; U.S. Patent No. 5,073,371, to Turner et al. issued December 17, 1991; and Segarin, et al., at Chapter VIII, pages 189 et seq., of Cosmetics Science and Technology, all of which are incorporated herein by reference in their entirety. Nonlimiting examples of sunscreens which are useful in the compositions of the present invention are those selected from the group consisting of 2-ethylhexyl *p*-methoxycinnamate, 2-ethylhexyl *N,N*-dimethyl-*p*-aminobenzoate, *p*-aminobenzoic acid, 2-phenylbenzimidazole-5-sulfonic acid, octocrylene, oxybenzone, homomenthyl salicylate, octyl salicylate, 4,4'-methoxy-*t*-butyldibenzoylmethane, 4-isopropyl dibenzoylmethane, 3-benzylidene camphor, 3-(4-methylbenzylidene) camphor, titanium dioxide, zinc oxide, silica, iron oxide, and mixtures thereof. Still other useful sunscreens are those disclosed in U.S. Patent No. 4,937,370, to Sabatelli, issued June 26, 1990; and U.S. Patent No. 4,999,186, to Sabatelli et al., issued March 12, 1991; these two references are incorporated by reference herein in their entirety. Especially preferred examples of these sunscreens include those selected from the group consisting of 4-*N,N*-(2-ethylhexyl)methylaminobenzoic acid ester of 2,4-dihydroxybenzophenone, 4-*N,N*-(2-ethylhexyl)methylaminobenzoic acid ester with 4-hydroxydibenzoylmethane, 4-*N,N*-(2-ethylhexyl)-methylaminobenzoic acid ester of 2-hydroxy-4-(2-hydroxyethoxy)benzophenone, 4-*N,N*-(2-ethylhexyl)-methylaminobenzoic acid ester of 4-(2-hydroxyethoxy)dibenzoylmethane, and mixtures thereof. Exact amounts of sunscreens which can be employed will vary depending upon the sunscreen chosen and the desired Sun Protection Factor (SPF) to be achieved. SPF is a commonly used measure of photoprotection of a

sunscreen against erythema. See Federal Register, Vol. 43, No. 166, pp. 38206-38269, August 25, 1978, which is incorporated herein by reference in its entirety.

#### Hydrocolloids

Hydrocolloids may also be optionally included in the articles of the present invention. Hydrocolloids are well known in the art and are helpful in extending the useful life of the surfactants contained in the cleansing component of the present invention such that the articles may last throughout at least one entire showering or bathing experience. Suitable hydrocolloids include, but are not limited to, xanthan gum, carboxymethyl cellulose, hydroxyethyl cellulose, hydroxylpropyl cellulose, methyl and ethyl cellulose, natural gums, gudras guar gum, bean gum, natural starches, deionitized starches (e.g., starch octenyl succinate) and the like.

#### Exothermic Zeolites

Zeolites and other compounds which react exothermically when combined with water may also be optionally included in the articles of the present invention.

#### Oil-soluble Polymeric Gelling Agents

The articles of present invention preferably comprise one or more polymeric materials which are oil-soluble and form a gel with hydrophobic materials (e.g. oils) of the therapeutic benefit component. Such polymers are beneficial for structuring these materials resulting in flexible gels with improved stability and shear-resistance.

When a hydrophobic gel is present, the articles preferably comprise from about 0.05% to about 100%, by weight of the substrate sheet, more preferably from about 0.1% to about 20%, and most preferably from about 1% to about 10%, of an oil-soluble polymeric gelling agent, calculated based on the dry weight of the polymeric gelling agent.

Particularly suitable are at least partially cross-linked oil-soluble polymeric materials with a softening point < 160° C. Suitable materials come from the chemical groups of PE (polyethylenes), PVA (polyvinyl alcohols) and derivatives, PVP (polyvinylpyrrolidones) and derivatives, PVP/Alkene Copolymers, PVP/VA copolymers, PVM/MA (methyl vinyl ether/maleic anhydride) copolymers and their esters and ethers, particularly poly (alkyl vinyl ether-co-maleic anhydride) copolymers, ethylene/VA copolymers, styrene/isoprene, styrene/ethylene/butylene, styrene/ethylene/propylene, styrene/ethylene/butylene/styrene and styrene/butadiene copolymers. Suitable materials are available e.g. from Dupont (ELVAX® types), BASF (LUVISKOL® types), Shell (KRATON® polymers) and ISP (PVP, GANTREZ® and GANEX® types).

#### Hydrogel Forming Polymeric Gelling Agents

In certain embodiments of the present invention, the articles may optionally comprise an aqueous gel, i.e., a "hydrogel", formed from a hydrogel forming polymeric gelling agent and water. More specifically, the hydrogel is contained within the cleansing component or the therapeutic benefit component of the article. When an aqueous gel is present, the articles preferably comprise from about 0.1% to about 100%, by weight of the water insoluble substrate, more preferably from about 3% to about 50%, and most preferably from about 5% to about

35%, of a hydrogel forming polymeric gelling agent, calculated based on the dry weight of the hydrogel forming polymeric gelling agent.

In general, the hydrogel forming polymeric gelling agent materials of the present invention are at least partially crosslinked polymers prepared from polymerizable, unsaturated acid-containing monomers which are water-soluble or become water-soluble upon hydrolysis. These include monoethylenically unsaturated compounds having at least one hydrophilic radical, including (but not limited to) olefinically unsaturated acids and anhydrides which contain at least one carbon-carbon olefinic double bond. With respect to these monomers, water-soluble means that the monomer is soluble in deionized water at 25°C at a level of at least 0.2%, preferably at least 1.0%.

Upon polymerization, monomeric units as described above will generally constitute from about 25 mole percent to 99.99 mole percent, more preferably from about 50 mole percent to 99.99 mole percent, most preferably at least about 75 mole percent of the polymeric gelling agent material (dry polymer weight basis), of acid-containing monomers.

The hydrogel forming polymeric gelling agent herein is partially crosslinked to a sufficient degree preferably that is high enough such that the resulting polymer does not exhibit a glass transition temperature ( $T_g$ ) below about 140°C, and accordingly, the term "hydrogel forming polymeric gelling agent," as used herein, shall mean polymers meeting this parameter. Preferably the hydrogel forming polymeric gelling agent does not have a  $T_g$  below about 180°C, and more preferably does not have a  $T_g$  prior to decomposition of the polymer, at temperatures of about 300°C or higher. The  $T_g$  can be determined by differential scanning calorimetry (DSC) conducted at a heating rate of 20.0 C°/minute with 5 mg or smaller samples. The  $T_g$  is calculated as the midpoint between the onset and endset of heat flow change corresponding to the glass transition on the DSC heat capacity heating curve. The use of DSC to determine  $T_g$  is well known in the art, and is described by B. Cassel and M. P. DiVito in "Use of DSC To Obtain Accurate Thermodynamic and Kinetic Data", American Laboratory, January 1994, pp 14-19, and by B. Wunderlich in Thermal Analysis, Academic Press, Inc., 1990.

The hydrogel forming polymeric material is characterized as highly absorbent and able to retain water in its absorbed or "gel" state. Preferred hydrogel forming polymeric gelling agent hereof will be able to absorb at least about 40 g water (deionized) per gram of gelling agent, preferably at least about 60 g/g, more preferably at least about 80 g/g. These values, referred to as "Absorptive Capacity" herein can be determined according to the procedure in the Absorptive Capacity "Tea Bag" test described above.

The hydrogel forming polymeric gelling agent hereof will, in general, be at least partially crosslinked. Suitable cross-linking agents are well known in the art and include, for example, (1) compounds having at least two polymerizable double bonds; (2) compounds having at least one polymerizable double bond and at least one functional group reactive with the acid-containing monomer material; (3) compounds having at least two functional groups reactive

with the acid-containing monomer material; and (4) polyvalent metal compounds which can form ionic cross-linkages.

Cross-linking agents having at least two polymerizable double bonds include (i) di- or polyvinyl compounds such as divinylbenzene and divinyltoluene; (ii) di- or poly-esters of unsaturated mono- or poly-carboxylic acids with polyols including, for example, di- or triacrylic acid esters of polyols such as ethylene glycol, trimethylol propane, glycerine, or polyoxyethylene glycols; (iii) bisacrylamides such as N,N-methylenebisacrylamide; (iv) carbamyl esters that can be obtained by reacting polyisocyanates with hydroxyl group-containing monomers; (v) di- or poly-allyl ethers of polyols; (vi) di- or poly-allyl esters of polycarboxylic acids such as diallyl phthalate, diallyl adipate, and the like; (vii) esters of unsaturated mono- or poly-carboxylic acids with mono-allyl esters of polyols such as acrylic acid ester of polyethylene glycol monoallyl ether; and (viii) di- or tri-allyl amine.

Cross-linking agents having at least one polymerizable double bond and at least one functional group reactive with the acid-containing monomer material include N-methylol acrylamide, glycidyl acrylate, and the like. Suitable cross-linking agents having at least two functional groups reactive with the acid-containing monomer material include glyoxal; polyols such as ethylene glycol and glycerol; polyamines such as alkylene diamines (e.g., ethylene diamine), polyalkylene polyamines, polyepoxides, di- or polyglycidyl ethers and the like. Suitable polyvalent metal cross-linking agents which can form ionic cross-linkages include oxides, hydroxides and weak acid salts (e.g., carbonate, acetate and the like) of alkaline earth metals (e.g., calcium, magnesium) and zinc, including, for example, calcium oxide and zinc diacetate.

Cross-linking agents of many of the foregoing types are described in greater detail in Masuda et al., U. S. Patent 4,076,663, issued February 28, 1978, and Allen et al., U. S. Patent 4,861,539, issued August 29, 1989, both incorporated herein by reference. Preferred cross-linking agents include the di- or polyesters of unsaturated mono- or polycarboxylic acids mono-allyl esters of polyols, the bisacrylamides, and the di- or tri-allyl amines. Specific examples of especially preferred cross-linking agents include N,N'-methylenebisacrylamide and trimethylol propane triacrylate.

The cross-linking agent will generally constitute from about 0.001 mole percent to 5 mole percent of the resulting hydrogel-forming polymeric material. More generally, the cross-linking agent will constitute from about 0.01 mole percent to 3 mole percent of the hydrogel-forming polymeric gelling agent used herein.

The hydrogel forming polymeric gelling agents hereof may be employed in their partially neutralized form. For purposes of this invention, such materials are considered partially neutralized when at least 25 mole percent, and preferably at least 50 mole percent of monomers used to form the polymer are acid group-containing monomers which have been neutralized with a base. Suitable neutralizing bases cations include hydroxides of alkali and alkaline earth metal (e.g. KOH, NaOH), ammonium, substituted ammonium, and amines such as

amino alcohols (e.g., 2-amino-2-methyl-1,3-propanediol, diethanolamine, and 2-amino-2-methyl-1-propanol. This percentage of the total monomers utilized which are neutralized acid group-containing monomers is referred to herein as the "degree of neutralization." The degree of neutralization will preferably not exceed 98%.

Hydrogel forming polymeric gelling agents suitable for use herein are well known in the art, and are described, for example, in U. S. Patent 4,076,663, Masuda et al., issued February 28, 1978; U. S. Patent 4,062,817, Westerman, issued December 13, 1977; U. S. Patent 4,286,082, Tsubakimoto et al., issued August 25, 1981; U. S. Patent 5,061,259, Goldman et al., issued October 29, 1991, and U. S. Patent 4,654,039, Brandt et al., issued March 31, 1987 each of which is incorporated herein in its entirety.

Hydrogel forming polymeric gelling agents suitable for use herein are also described in U. S. Patent 4,731,067, Le-Khac, issued March 15, 1988, U. S. Patent 4,743,244, Le-Khac, issued May 10, 1988, U. S. Patent 4,813,945, Le-Khac, issued March 21, 1989, U. S. Patent 4,880,868, Le-Khac, issued November 14, 1989, U. S. Patent 4,892,533, Le-Khac, issued January 9, 1990, U. S. Patent 5,026,784, Le-Khac, issued June 25, 1991, U. S. Patent 5,079,306, Le-Khac, issued January 7, 1992, U. S. Patent 5,151,465, Le-Khac, issued September 29, 1992, U. S. Patent 4,861,539, Allen, Farrer, and Flesher, issued August 29, 1989, and U. S. Patent 4,962,172, Allen, Farrer, and Flesher, issued October 9, 1990, each of which is incorporated herein by reference in its entirety.

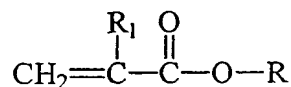
Suitable hydrogel forming polymeric gelling agents in the form of particles are commercially available from Hoechst Celanese Corporation, Portsmouth, VA, USA (Sanwet™ Superabsorbent Polymers) Nippon Shokubai, Japan (Aqualic™, e.g., L-75, L-76) and Dow Chemical Company, Midland, MI, USA (Dry Tech™).

Hydrogel forming polymeric gelling agents in the form of fibers are commercially available from Camelot Technologies Inc., Leominster, MA, USA (Fibersorb™, e.g., SA 7200H, SA 7200M, SA 7000L, SA 7000, and SA 7300).

The articles of the present invention may also contain other hydrophilic gelling agents. These include carboxylic acid-containing polymers as otherwise described above, except which have relatively lower degrees of crosslinking, such that they exhibit a Tg below 140°C, as well as a variety of other water soluble or colloiddally water soluble polymers, such as cellulose ethers (e.g. hydroxyethyl cellulose, methyl cellulose, hydroxy propylmethyl cellulose), polyvinylpyrrolidone, polyvinylalcohol, guar gum, hydroxypropyl guar gum and xanthan gum. Preferred among these additional hydrophilic gelling agents are the acid-containing polymers, particularly carboxylic acid-containing polymers. Especially preferred are those that comprise water-soluble polymer of acrylic acid crosslinked with a polyalkenyl polyether of a polyhydric alcohol, and optionally an acrylate ester or a polyfunctional vinylidene monomer.

Preferred copolymers useful in the present invention are polymers of a monomeric mixture containing 95 to 99 weight percent of an olefinically unsaturated carboxylic monomer

selected from the group consisting of acrylic, methacrylic and ethacrylic acids; about 1 to about 3.5 weight percent of an acrylate ester of the formula:

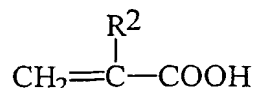


wherein R is an alkyl radical containing 10 to 30 carbon atoms and R<sub>1</sub> is hydrogen, methyl or ethyl; and 0.1 to 0.6 weight percent of a polymerizable cross-linking polyalkenyl polyether of a polyhydric alcohol containing more than one alkenyl ether group per molecule wherein the parent polyhydric alcohol contains at least 3 carbon atoms and at least 3 hydroxyl groups.

Preferably, these polymers contain from about 96 to about 97.9 weight percent of acrylic acid and from about 2.5 to about 3.5 weight percent of acrylic esters wherein the alkyl group contains 12 to 22 carbon atoms, and R<sub>1</sub> is methyl, most preferably the acrylate ester is stearyl methacrylate. Preferably, the amount of crosslinking polyalkenyl polyether monomer is from about 0.2 to 0.4 weight percent. The preferred crosslinking polyalkenyl polyether monomers are allyl pentaerythritol, trimethylolpropane diallylether or allyl sucrose. These polymers are fully described in U. S. Patent No. 4,509,949, to Huang et al., issued April 5, 1985, this patent being incorporated herein by reference.

Other preferred copolymers useful in the present invention are the polymers which contain at least two monomeric ingredients, one being a monomeric olefinically-unsaturated carboxylic acid, and the other being a polyalkenyl, polyether of a polyhydric alcohol. Additional monomeric materials may be present in the monomeric mixture if desired, even in predominant proportion.

The first monomeric ingredient useful in the production of these carboxylic polymers are the olefinically-unsaturated carboxylic acids containing at least one activated carbon-to-carbon olefinic double bond, and at least one carboxyl group. The preferred carboxylic monomers are the acrylic acids having the general structure



wherein R<sup>2</sup> is a substituent selected from the class consisting of hydrogen, halogen, and the cyanogen (-C≡N) groups, monovalent alkyl radicals, monovalent alkaryl radicals and monovalent cycloaliphatic radicals. Of this class, acrylic, methacrylic, and ethacrylic acid are most preferred. Another useful carboxylic monomer is maleic anhydride or the acid. The amount of acid used will be from about 95.5 to about 98.9 weight percent.

The second monomeric ingredient useful in the production of these carboxylic polymers are the polyalkenyl polyethers having more than one alkenyl ether grouping per molecule, such as alkenyl groups in which an olefinic double bond is present attached to a terminal methylene grouping, CH<sub>2</sub>=C<.

The additional monomeric materials which may be present in the polymers include polyfunctional vinylidene monomers containing at least two terminal  $\text{CH}_2<$  groups, including for example, butadiene, isoprene, divinyl benzene, divinyl naphthlene, allyl acrylates, and the like. These polymers are fully described in U. S. Patent No. 2,798,053, to Brown, issued July 2, 1957, which is incorporated herein by reference in its entirety.

Examples of carboxylic acid copolymers useful in the present invention include Carbomer 934, Carbomer 941, Carbomer 950, Carbomer 951, Carbomer 954, Carbomer 980, Carbomer 981, Carbomer 1342, acrylates/C10-30 alkyl acrylate cross polymer (available as Carbopol 934, Carbopol 941, Carbopol 950, Carbopol 951, Carbopol 954, Carbopol 980, Carbopol 981, Carbopol 1342, and the Pemulen series, respectively, from B. F. Goodrich).

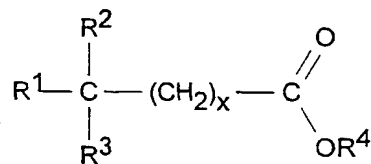
Other carboxylic acid copolymers useful in the present invention include sodium salts of acrylic acid/acrylamide copolymers sold by the Hoechst Celanese Corporation under the trademark of Hostaceren PN73. Also included are the hydrogel polymers sold by Lipo Chemicals Inc. under the trademark of HYPAN hydrogels. These hydrogels consist of crystalline plucks of nitrates on a C-C backbone with various other pendant groups such as carboxyls, amides, and amidines. An example would include HYPAN SA 100 H, a polymer powder available from Lipo Chemical.

Neutralizing agents for use in neutralizing the acidic groups of these polymers include those previously described.

#### High spreading oil

Another optional ingredient in the benefit component of the articles of the present invention is a "high spreading oil." It is especially preferred that this high spreading oil be included when a vitamin B<sub>3</sub> compound is included in the benefit component. Highly preferred conditioning components further comprise from 3% to 10%, preferably from about 3% to about 8%, more preferably from about 4% to about 6%, of a high spreading oil selected from

- i) branched chain hydrocarbons having a weight average molecular weight of from about 100 to about 1000 and
- ii) liquid ester emollients of formula I:



Formula I

wherein  $\text{R}^1$  is selected from H or  $\text{CH}_3$ ,  $\text{R}^2$ ,  $\text{R}^3$  and  $\text{R}^4$  are independently selected from  $\text{C}_1$ - $\text{C}_{20}$  straight chain or branched chain alkyl, and x is an integer of from 1 to 20.

These high spreading oils are useful for distributing the vitamin B<sub>3</sub> compound on skin.

Suitable examples of branched chain hydrocarbons include isododecane, isohexadecane and isoeicosane. Preferred is isohexadecane. The poly(alphaolefin) anti-tack agents herein, described in further detail below, are typically also branched chain hydrocarbons. When these anti-tack agents are used then their amount is to be considered included in the levels of high spreading oils referred to above.

Suitable ester emollient materials of Formula I above include methyl isostearate, isopropyl isostearate, isostearyl neopentanoate, isononyl isononanoate, isodecyl octanoate, isodecyl isononanoate, tridecyl isononanoate, myristyl octanoate, octyl pelargonate, octyl isononanoate, myristyl myristate, myristyl neopentanoate, isostearyl neopentanoate, myristyl octanoate, myristyl propionate, isopropyl myristate and mixtures thereof. Preferred ester emollients for use herein are isononyl isononanoate, isostearyl neopentanoate, methyl isostearate, isopropyl isostearate, isopropyl stearate, isopropyl myristate and mixtures thereof.

Particularly preferred high spreading oils for use herein are isohexadecane, isononyl isononanoate, methyl isostearate, isopropyl isostearate, or mixtures thereof. Even more preferred for use herein is a mixture of high spreading oils comprising isohexadecane and isopropyl isostearate. Such a mixture is particularly preferred when the compositions of the invention comprise high levels of glycerine. The ester emollient material is preferably present in the compositions at a level of from about 0.1% to about 10%, preferably from about 0.1% to about 8%, especially from about 0.5% to about 5% by weight of composition.

#### Anti-tack agents

It is preferred that one or more anti-tack agents be included in the benefit component of the present invention when a vitamin B<sub>3</sub> compound is present as well. Preferably such benefit components comprise from about 0.3% to about 4%, preferably from about 0.5% to about 2.5%, more preferably from about 1% to about 2%, of an anti-tack agent selected from a poly(alphaolefin) having a MW of from about 260 to about 1000 and an occlusive agent selected from petrolatum, cetyl ricinoleate and lanolin. Without being limited by theory, it appears that the poly(alphaolefin) anti-tack agents and the occlusive anti-tack agents act via different mechanisms. Nevertheless, both are effective in reducing the sticky skin feel associated with elevated levels of vitamin B<sub>3</sub> compounds. Although mixtures of the anti-tack agents are not excluded, best benefits are obtained when the anti-tack agent is selected from just one of the two classes.

Suitable poly(alphaolefins) as described above can be derived from 1-alkene monomers having from about 6 to about 14 carbon atoms, preferably from about 6 to about 12 carbon atoms, especially from about 8 to about 12 carbon atoms. The poly(alphaolefins) useful herein are preferably hydrogenated poly(alphaolefin) oligomers. Examples of 1-alkene monomers for use in preparing the polyalphaolefin oligomers herein include 1-hexene, 1-octene, 1-decene, 1-dodecene, 1-tetradecene, branched chain isomers such as 4-methyl-1-pentene, and combinations thereof. Most preferred are oligomers of 1-octene to 1-dodecene or combinations thereof. Especially preferred is polydecene. Suitable polydecene oils are commercially available from

Mobil Chemical Company, P.O. Box 3140, Edison, New Jersey 08818, USA, under the tradename Puresyn® 4 and from BP Amoco of 200 E. Randolph Drive, Chicago, IL 60601-7125 under the tradename Silkflo® 364 NF. Most preferred as an anti-tack agent is petrolatum.

#### Inorganic matting agent

Inorganic matting agents, such as titanium or zinc oxides, are also useful in the benefit component of the present articles. When present, the matting agent is used at a level of no more than 3% to avoid undesirable skin whitening or an unnaturally 'opaque' appearance. Preferred for use herein is titanium dioxide and especially anatase titanium dioxide.

Anatase titanium oxide has a density of about 3.90 g/cm<sup>3</sup> and a tetragonal, cubic close packed structure. The refractive index of anatase titanium oxide is 2.55. Anatase titanium dioxide is available from Kobo Products Inc. under the trade name Kobo BTD 11S2, from Whittaker, Clark, Daniels, South Plainfield, New Jersey, USA, under the trade name TiO<sub>2</sub> 9729, and from Cardre Inc., South Plainfield, New Jersey, USA, under the trade name Carde 70429.

The preferred matting agents for use herein from the viewpoint of skin feel, skin appearance and emulsion compatibility are coated pigments. The pigments can be treated with compounds such as amino acids such as lysine, silicones, lauroyl, collagen, polyethylene, lecithin and ester oils. The most preferred matting agents are the organosilicon (polysiloxane) treated pigments, for example polysiloxane treated titanium dioxide. Most preferred is polysiloxane treated anatase titanium dioxide. The function of the surface treatment is to hydrophobically-modify the pigments so that they are "wetable" in an oil phase of oil-in-water emulsions.

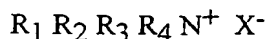
The total concentration of the inorganic matting agent may be from about 0% to about 3% and is preferably from about 0.1 to about 2.5%, preferably from about 0.25 to 2%

#### Cationic Surfactants

Cationic surfactants are typically categorized as non-lathering surfactants but may be used in the articles of the present invention provided they do not negatively impact the desired benefits of the articles.

Nonlimiting examples of cationic surfactants useful herein are disclosed in McCutcheon's, Detergents and Emulsifiers, North American edition (1986), published by allured Publishing Corporation; and McCutcheon's, Functional Materials, North American Edition (1992); both of which are incorporated by reference herein in their entirety.

Nonlimiting examples of cationic surfactants useful herein include cationic alkyl ammonium salts such as those having the formula:



wherein  $R_1$ , is selected from an alkyl group having from about 12 to about 18 carbon atoms, or aromatic, aryl or alkaryl groups having from about 12 to about 18 carbon atoms;  $R_2$ ,  $R_3$ , and  $R_4$  are independently selected from hydrogen, an alkyl group having from about 1 to about 18

carbon atoms, or aromatic, aryl or alkaryl groups having from about 12 to about 18 carbon atoms; and X is an anion selected from chloride, bromide, iodide, acetate, phosphate, nitrate, sulfate, methyl sulfate, ethyl sulfate, tosylate, lactate, citrate, glycolate, and mixtures thereof. Additionally, the alkyl groups can also contain ether linkages, or hydroxy or amino group substituents (e.g., the alkyl groups can contain polyethylene glycol and polypropylene glycol moieties).

More preferably,  $R_1$  is an alkyl group having from about 12 to about 18 carbon atoms;  $R_2$  is selected from H or an alkyl group having from about 1 to about 18 carbon atoms;  $R_3$  and  $R_4$  are independently selected from H or an alkyl group having from about 1 to about 3 carbon atoms; and X is as described in the previous paragraph.

Most preferably,  $R_1$  is an alkyl group having from about 12 to about 18 carbon atoms;  $R_2$ ,  $R_3$ , and  $R_4$  are selected from H or an alkyl group having from about 1 to about 3 carbon atoms; and X is as described previously.

Alternatively, other useful cationic surfactants include amino-amides, wherein in the above structure  $R_1$  is alternatively  $R_5CO-(CH_2)_n-$ , wherein  $R_5$  is an alkyl group having from about 12 to about 22 carbon atoms, and n is an integer from about 2 to about 6, more preferably from about 2 to about 4, and most preferably from about 2 to about 3. Nonlimiting examples of these cationic emulsifiers include stearamidopropyl PG-dimonium chloride phosphate, stearamidopropyl ethyldimonium ethosulfate, stearamidopropyl dimethyl (myristyl acetate) ammonium chloride, stearamidopropyl dimethyl cetearyl ammonium tosylate, stearamidopropyl dimethyl ammonium chloride, stearamidopropyl dimethyl ammonium lactate, and mixtures thereof.

Nonlimiting examples of quaternary ammonium salt cationic surfactants include those selected from the group consisting of cetyl ammonium chloride, cetyl ammonium bromide, lauryl ammonium chloride, lauryl ammonium bromide, stearyl ammonium chloride, stearyl ammonium bromide, cetyl dimethyl ammonium chloride, cetyl dimethyl ammonium bromide, lauryl dimethyl ammonium chloride, lauryl dimethyl ammonium bromide, stearyl dimethyl ammonium chloride, stearyl dimethyl ammonium bromide, cetyl trimethyl ammonium chloride, cetyl trimethyl ammonium bromide, lauryl trimethyl ammonium chloride, lauryl trimethyl ammonium bromide, stearyl trimethyl ammonium chloride, stearyl trimethyl ammonium bromide, lauryl dimethyl ammonium chloride, stearyl dimethyl cetyl ditallow dimethyl ammonium chloride, dicetyl ammonium chloride, dicetyl ammonium bromide, dilauryl ammonium chloride, dilauryl ammonium bromide, distearyl ammonium chloride, distearyl ammonium bromide, dicetyl methyl ammonium chloride, dicetyl methyl ammonium bromide, dilauryl methyl ammonium chloride, dilauryl methyl ammonium bromide, distearyl methyl ammonium chloride, distearyl dimethyl ammonium chloride, distearyl methyl ammonium bromide, and mixtures thereof. Additional quaternary ammonium salts include those wherein the C12 to C22 alkyl carbon chain is derived from a tallow fatty acid or from a coconut fatty

acid. The term "tallow" refers to an alkyl group derived from tallow fatty acids (usually hydrogenated tallow fatty acids), which generally have mixtures of alkyl chains in the C16 to C18 range. The term "coconut" refers to an alkyl group derived from a coconut fatty acid, which generally have mixtures of alkyl chains in the C12 to C14 range. Examples of quaternary ammonium salts derived from these tallow and coconut sources include ditallow dimethyl ammonium chloride, ditallow dimethyl ammonium methyl sulfate, di(hydrogenated tallow) dimethyl ammonium chloride, di(hydrogenated tallow) dimethyl ammonium acetate, ditallow dipropyl ammonium phosphate, ditallow dimethyl ammonium nitrate, di(coconutalkyl)dimethyl ammonium chloride, di(coconutalkyl)dimethyl ammonium bromide, tallow ammonium chloride, coconut ammonium chloride, stearamidopropyl PG-dimonium chloride phosphate, stearamidopropyl ethyldimonium ethosulfate, stearamidopropyl dimethyl (myristyl acetate) ammonium chloride, stearamidopropyl dimethyl cetearyl ammonium tosylate, stearamidopropyl dimethyl ammonium chloride, stearamidopropyl dimethyl ammonium lactate, and mixtures thereof.

Preferred cationic surfactants useful herein include those selected from the group consisting of dilauryl dimethyl ammonium chloride, distearyl dimethyl ammonium chloride, dimyristyl dimethyl ammonium chloride, dipalmityl dimethyl ammonium chloride, distearyl dimethyl ammonium chloride, and mixtures thereof.

#### Chelators

The articles of the present invention may also comprise a safe and effective amount of a chelator or chelating agent. As used herein, "chelator" or "chelating agent" means an active agent capable of removing a metal ion from a system by forming a complex so that the metal ion cannot readily participate in or catalyze chemical reactions. The inclusion of a chelating agent is especially useful for providing protection against UV radiation that can contribute to excessive scaling or skin texture changes and against other environmental agents, which can cause skin damage.

A safe and effective amount of a chelating agent may be added to the compositions of the subject invention, preferably from about 0.1% to about 10%, more preferably from about 1% to about 5%, of the composition. Exemplary chelators that are useful herein are disclosed in U.S. Patent No. 5,487,884, issued 1/30/96 to Bissett et al.; International Publication No. 91/16035, Bush et al., published 10/31/95; and International Publication No. 91/16034, Bush et al., published 10/31/95. Preferred chelators useful in compositions of the subject invention are furildioxime, furildioxime derivatives, furilmonoxime, furilmonoxime derivatives, and combinations thereof.

#### Flavonoids

The articles of the present invention may optionally comprise a flavonoid compound. Flavonoids are broadly disclosed in U.S. Patents 5,686,082 and 5,686,367, both of which are herein incorporated by reference. Flavonoids suitable for use in the present invention are flavanones selected from the group consisting of unsubstituted flavanones, mono-substituted

flavanones, and mixtures thereof; chalcones selected from the group consisting of unsubstituted chalcones, mono-substituted chalcones, di-substituted chalcones, tri-substituted chalcones, and mixtures thereof; flavones selected from the group consisting of unsubstituted flavones, mono-substituted flavones, di-substituted flavones, and mixtures thereof; one or more isoflavones; coumarins selected from the group consisting of unsubstituted coumarins, mono-substituted coumarins, di-substituted coumarins, and mixtures thereof; chromones selected from the group consisting of unsubstituted chromones, mono-substituted chromones, di-substituted chromones, and mixtures thereof; one or more dicoumarols; one or more chromanones; one or more chromanols; isomers (e.g., cis/trans isomers) thereof; and mixtures thereof. By the term "substituted" as used herein means flavonoids wherein one or more hydrogen atom of the flavonoid has been independently replaced with hydroxyl, C1-C8 alkyl, C1-C4 alkoxy, O-glycoside, and the like or a mixture of these substituents.

Examples of suitable flavonoids include, but are not limited to, unsubstituted flavanone, mono-hydroxy flavanones (e.g., 2'-hydroxy flavanone, 6-hydroxy flavanone, 7-hydroxy flavanone, etc.), mono-alkoxy flavanones (e.g., 5-methoxy flavanone, 6-methoxy flavanone, 7-methoxy flavanone, 4'-methoxy flavanone, etc.), unsubstituted chalcone (especially unsubstituted trans-chalcone), mono-hydroxy chalcones (e.g., 2'-hydroxy chalcone, 4'-hydroxy chalcone, etc.), di-hydroxy chalcones (e.g., 2', 4'-dihydroxy chalcone, 2',4'-dihydroxy chalcone, 2,2'-dihydroxy chalcone, 2',3'-dihydroxy chalcone, 2',5'-dihydroxy chalcone, etc.), and tri-hydroxy chalcones (e.g., 2',3',4'-trihydroxy chalcone, 4,2',4'-trihydroxy chalcone, 2,2',4'-trihydroxy chalcone, etc.), unsubstituted flavone, 7,2'-dihydroxy flavone, 3',4'-dihydroxy naphthoflavone, 4'-hydroxy flavone, 5,6-benzoflavone, and 7,8-benzoflavone, unsubstituted isoflavone, daidzein (7,4'-dihydroxy isoflavone), 5,7-dihydroxy-4'-methoxy isoflavone, soy isoflavones (a mixture extracted from soy), unsubstituted coumarin, 4-hydroxy coumarin, 7-hydroxy coumarin, 6-hydroxy-4-methyl coumarin, unsubstituted chromone, 3-formyl chromone, 3-formyl-6-isopropyl chromone, unsubstituted dicoumarol, unsubstituted chromanone, unsubstituted chromanol, and mixtures thereof.

Preferred for use herein are unsubstituted flavanone, methoxy flavanones, unsubstituted chalcone, 2', 4'-dihydroxy chalcone, and mixtures thereof. Most preferred are unsubstituted flavanone, unsubstituted chalcone (especially the trans isomer), and mixtures thereof.

They can be synthetic materials or obtained as extracts from natural sources (e.g., plants). The naturally sourced material can also further be derivatized (e.g., a glycoside, an ester or an ether derivative prepared following extraction from a natural source). Flavonoid compounds useful herein are commercially available from a number of sources, e.g., Indofine Chemical Company, Inc. (Somerville, New Jersey), Steraloids, Inc. (Wilton, New Hampshire), and Aldrich Chemical Company, Inc. (Milwaukee, Wisconsin).

Mixtures of the above flavonoid compounds may also be used.

The herein described flavonoid compounds are preferably present in the instant invention at concentrations of from about 0.01% to about 20%, more preferably from about 0.1% to about 10%, and most preferably from about 0.5% to about 5%.

#### Sterols

The articles of the present invention may comprise a safe and effective amount of one or more sterol compounds. Examples of useful sterol compounds include sitosterol, stigmasterol, campesterol, brassicasterol, lanosterol, 7-dehydrocholesterol, and mixtures thereof. These can be synthetic in origin or from natural sources, e.g., blends extracted from plant sources (e.g., phytosterols).

#### Anti-Cellulite Agents

The articles of the present invention may also comprise a safe and effective amount of an anti-cellulite agent in the benefit component. Suitable agents may include, but are not limited to, xanthine compounds (e.g., caffeine, theophylline, theobromine, and aminophylline).

#### Skin Lightening Agents

The articles of the present invention may comprise a skin lightening agent. When used, the compositions preferably comprise from about 0.1% to about 10%, more preferably from about 0.2% to about 5%, also preferably from about 0.5% to about 2%, by weight of the composition, of a skin lightening agent. Suitable skin lightening agents include those known in the art, including kojic acid, arbutin, ascorbic acid and derivatives thereof, e.g., magnesium ascorbyl phosphate or sodium ascorbyl phosphate or other salts of ascorbyl phosphate. Skin lightening agents suitable for use herein also include those described in copending patent application Serial No. 08/479,935, filed on June 7, 1995 in the name of Hillebrand, corresponding to PCT Application No. U.S. 95/07432, filed 6/12/95; and copending patent application Serial No. 08/390,152, filed on February 24, 1995 in the names of Kalla L. Kvalnes, Mitchell A. DeLong, Barton J. Bradbury, Curtis B. Motley, and John D. Carter, corresponding to PCT Application No. U.S. 95/02809, filed 3/1/95, published 9/8/95.

#### Binders

The articles of the present invention may optionally comprise binders. Binders or binding materials are useful for sealing the various layers of the present articles to one another thereby maintaining the integrity of the article. The binders may be in a variety of forms including, but not limited to, spray on, webs, separate layers, binding fibers, etc. Suitable binders may comprise latexes, polyamides, polyesters, polyolefins and combinations thereof.

### OPTIONAL INGREDIENTS SUITABLE FOR INCLUSION INTO HOUSEHOLD CARE ARTICLES (E.G., HARD SURFACE CLEANING) OF THE PRESENT INVENTION

#### Organic Cleaning Solvent

The cleaning component of the disclosed disposable articles may contain an effective amount of one or more organic cleaning solvents, typically no less than about 0.25%, and, at least about, in increasing order of preference, about 0.5% and about 3.0%, and no more than

about, in increasing order of preference, about 7% and about 5% by weight of the cleaning component.

The surfactant provides cleaning and/ or wetting even without a hydrophobic cleaning solvent present. However, the cleaning can normally be further improved by the use of the right organic cleaning solvent. By organic cleaning solvent, it is meant an agent which assists the surfactant to remove soils such as those commonly encountered in the bathroom. The organic cleaning solvent also can participate in the building of viscosity, if needed, and in increasing the stability of the composition. The compositions containing  $C_{8-16}$  alkyl polyglucosides and  $C_{8-14}$  alkylethoxylates also have lower sudsing when the solvent is present. Thus, the suds profile can be controlled in large part by simply controlling the level of hydrophobic solvent in the formulation.

Such solvents typically have a terminal  $C_3$ - $C_6$  hydrocarbon attached to from one to three ethylene glycol or propylene glycol moieties to provide the appropriate degree of hydrophobicity and, preferably, surface activity. Examples of commercially available hydrophobic cleaning solvents based on ethylene glycol chemistry include mono-ethylene glycol n-hexyl ether (Hexyl Cellosolve® available from Union Carbide). Examples of commercially available hydrophobic cleaning solvents based on propylene glycol chemistry include the di-, and tri-propylene glycol derivatives of propyl and butyl alcohol, which are available from Arco Chemical, 3801 West Chester Pike, Newtown Square, PA 19073) and Dow Chemical (1691 N. Swede Road, Midland, Michigan) under the trade names Arcosolv® and Dowanol®.

In the context of the present invention, preferred solvents are selected from the group consisting of mono-propylene glycol mono-propyl ether, di-propylene glycol mono-propyl ether, mono-propylene glycol mono-butyl ether, di-propylene glycol mono-propyl ether, di-propylene glycol mono-butyl ether; tri-propylene glycol mono-butyl ether; ethylene glycol mono-butyl ether; di-ethylene glycol mono-butyl ether, ethylene glycol mono-hexyl ether and di-ethylene glycol mono-hexyl ether, and mixtures thereof. "Butyl" includes both normal butyl, isobutyl and tertiary butyl groups. Mono-propylene glycol and mono-propylene glycol mono-butyl ether are the most preferred cleaning solvent and are available under the tradenames Dowanol DPnP® and Dowanol DPnB®. Di-propylene glycol mono-t-butyl ether is commercially available from Arco Chemical under the tradename Arcosolv PTB®.

The amount of organic cleaning solvent can vary depending on the amount of other ingredients present in the composition. The hydrophobic cleaning solvent is normally helpful in providing good cleaning, such as in floor cleaner applications.

For cleaning in enclosed spaces, the solvent can cause the formation of undesirably small respirable droplets, so compositions/solutions for use in treating such spaces are desirably substantially free, more preferably completely free, of such solvents.

#### Cosurfactants

The cleaning component of the present articles can include a small amount of additional anionic and/or nonionic detergent surfactant. Such anionic surfactants typically comprise a hydrophobic chain containing from about 8 carbon atoms to about 18, preferably from about 8 to about 16, carbon atoms, and typically include a sulfonate or carboxylate hydrophilic head group. In general, the level of optional, e.g., anionic, surfactants in the compositions herein is from about 0.01% to about 0.25%, more preferably from about 0.01% to about 0.2%, most preferably from about 0.01% to about 0.1%, by weight of the cleaning component.

In the context of floor, counter and other surface applications, the choice of cosurfactant can be critical in both selection of type and level. In cleaning components comprising  $C_8$ - $C_{14}$  alkyl ethoxylates, it is found that low levels of  $C_8$  sulfonate can improve end result by providing a "toning" effect. By toning, it is meant an improvement in the visual appearance of the end result, due to less haziness. If present, the  $C_8$  sulfonate is preferably used in from about 1:10 to about 1:1 weight ratio with respect to the primary surfactant(s).  $C_8$  sulfonate is commercially available from Stepan under the tradename Bio-Terge PAS-8<sup>®</sup> as well as from the Witco Corporation under the tradename Witconate NAS-8<sup>®</sup>. Another outstanding "toning" surfactant of benefit to the present invention is Poly-Tergent CS-1 which can be purchased from BASF. If present, the Poly-Tergent CS-1 is preferably used in from about 1:20 to about 1:1 weight ratio with respect to the primary surfactant(s).

Other surfactants that can be used, though less preferably, and typically at very low levels, include  $C_8$ - $C_{18}$  alkyl sulfonates (Hostapur SAS<sup>®</sup> from Hoechst, Aktiengesellschaft, D-6230 Frankfurt, Germany),  $C_{10}$ - $C_{14}$  linear or branched alkyl benzene sulfonates,  $C_9$ - $C_{15}$  alkyl ethoxy carboxylates detergent surfactant (Neodox<sup>®</sup> surfactants available from Shell Chemical Corporation),  $C_{10-14}$  alkyl sulfates and ethoxysulfates (e.g., Stepanol AM<sup>®</sup> from Stepan). Alkyl ethoxy carboxylates can be advantageously used at extremely low levels (about 0.01% or lower) to dissolve perfume. This can be an important benefit given the low levels of active needed for the present invention to be most effective as a household cleaning article.

Alternative nonionic detergent surfactants for use herein are alkoxyated alcohols generally comprising from about 6 to about 16 carbon atoms in the hydrophobic alkyl chain of the alcohol. Typical alkoxylation groups are propoxy groups or propoxy groups in combination with ethoxy groups. Such compounds are commercially available under the tradename Antarox<sup>®</sup> available from Rhodia (P.O. Box 425 Cranberry, New Jersey 08512) with a wide variety of chain length and alkoxylation degrees. Block copolymers of ethylene oxide and propylene oxide can also be used and are available from BASF under the tradename Pluronic<sup>®</sup>. Preferred nonionic detergent surfactants for use herein are according to the formula  $R(X)_nH$ , where R is an alkyl chain having from about 6 to about 16 carbon atoms, preferably from about 8 to about 12, X is a propoxy, or a mixture of ethoxy and propoxy groups, n is an integer of from about 4 to about 30, preferably from about 5 to about 8. Other non-ionic surfactants that can be used include those derived from natural sources such as sugars and include  $C_8$ - $C_{16}$  N-alkyl

glucose amide surfactants. If present, the concentration of alternative nonionic surfactant is from about 0.01% to about 0.2%, more preferably from about 0.01% to about 0.1%, by weight of the cleaning component.

#### Mono- or Polycarboxylic Acid

For purposes of soap scum and hard water stain removal, the cleaning component of the article can be made acidic with a pH of from about 2 to about 5, more preferably about 3. Acidity is accomplished, at least in part, through the use of one or more organic acids that have a pKa of less than about 5, preferably less than about 4. Such organic acids also can assist in phase formation for thickening, if needed, as well as provide hard water stain removal properties. It is found that organic acids are very efficient in promoting good hard water removal properties within the framework of the compositions of the present invention. Lower pH and use of one or more suitable acids is also found to be advantageous for disinfectancy benefits.

Examples of suitable mono-carboxylic acids include acetic acid, glycolic acid or  $\beta$ -hydroxy propionic acid and the like. Examples of suitable polycarboxylic acids include citric acid, tartaric acid, succinic acid, glutaric acid, adipic acid, and mixtures thereof. Such acids are readily available in the trade. Examples of more preferred polycarboxylic acids, especially non-polymeric polycarboxylic acids, include citric acid (available from Aldrich Corporation, 1001 West Saint Paul Avenue, Milwaukee, Wisconsin), a mixture of succinic, glutaric and adipic acids available from DuPont (Wilmington, Delaware) sold as "refined AGS di-basic acids", maleic acid (also available from Aldrich), and mixtures thereof. Citric acid is most preferred, particularly for applications requiring cleaning of soap scum. Glycolic acid and the mixture of adipic, glutaric and succinic acids provide greater benefits for hard water removal. The amount of organic acid in the compositions herein can be from about 0.01% to about 1%, more preferably from about 0.01% to about 0.5%, most preferably from about 0.025% to about 0.25% by weight of the cleaning component.

#### Odor Control Agents

Cyclodextrins may be used in the cleaning component of the present invention. As used herein, the term "cyclodextrin" includes any of the known cyclodextrins such as unsubstituted cyclodextrins containing from six to twelve glucose units, especially, alpha-cyclodextrin, beta-cyclodextrin, gamma-cyclodextrin and/or their derivatives and/or mixtures thereof. The alpha-cyclodextrin consists of six glucose units, the beta-cyclodextrin consists of seven glucose units, and the gamma-cyclodextrin consists of eight glucose units arranged in donut-shaped rings. The specific coupling and conformation of the glucose units give the cyclodextrins rigid, conical molecular structures with hollow interiors of specific volumes. The "lining" of each internal cavity is formed by hydrogen atoms and glycosidic bridging oxygen atoms; therefore, this surface is fairly hydrophobic. The unique shape and physical-chemical properties of the cavity enable the cyclodextrin molecules to absorb (form inclusion complexes with) organic molecules or parts of organic molecules which can fit into the cavity. Many odorous molecules can fit into

the cavity including many malodorous molecules and perfume molecules. Therefore, cyclodextrins, and especially mixtures of cyclodextrins with different size cavities, can be used to control odors caused by a broad spectrum of organic odoriferous materials, which may, or may not, contain reactive functional groups. The complexation between cyclodextrin and odorous molecules occurs rapidly in the presence of water. However, the extent of the complex formation also depends on the polarity of the absorbed molecules. In an aqueous solution, strongly hydrophilic molecules (those which are highly water-soluble) are only partially absorbed, if at all. Therefore, cyclodextrin does not complex effectively with some very low molecular weight organic amines and acids when they are present at low levels on wet surfaces. As the water is being removed however, e.g., the surface is being dried off, some low molecular weight organic amines and acids have more affinity and will complex with the cyclodextrins more readily.

The cavities within the cyclodextrin in the solution of the present invention should remain essentially unfilled (the cyclodextrin remains uncomplexed) while in solution, in order to allow the cyclodextrin to absorb various odor molecules when the solution is applied to a surface. Non-derivatized (normal) beta-cyclodextrin can be present at a level up to its solubility limit of about 1.85% (about 1.85g in 100 grams of water) at room temperature. Beta-cyclodextrin is not preferred in components which call for a level of cyclodextrin higher than its water solubility limit. Non-derivatized beta-cyclodextrin is generally not preferred when the component contains surfactant since it affects the surface activity of most of the preferred surfactants that are compatible with the derivatized cyclodextrins.

Preferably, an aqueous cleaning component of the present invention is clear. The term "clear" as defined herein means transparent or translucent, preferably transparent, as in "water clear," when observed through a layer having a thickness of less than about 10 cm.

Preferably, the cyclodextrins used in the present invention are highly water-soluble such as, alpha-cyclodextrin and/or derivatives thereof, gamma-cyclodextrin and/or derivatives thereof, derivatised beta-cyclodextrins, and/or mixtures thereof. The derivatives of cyclodextrin consist mainly of molecules wherein some of the OH groups are converted to OR groups. Cyclodextrin derivatives include, e.g., those with short chain alkyl groups such as methylated cyclodextrins, and ethylated cyclodextrins, wherein R is a methyl or an ethyl group; those with hydroxyalkyl substituted groups, such as hydroxypropyl cyclodextrins and/or hydroxyethyl cyclodextrins, wherein R is a  $-\text{CH}_2-\text{CH}(\text{OH})-\text{CH}_3$  or a  $-\text{CH}_2\text{CH}_2-\text{OH}$  group; branched cyclodextrins such as maltose-bonded cyclodextrins; cationic cyclodextrins such as those containing 2-hydroxy-3-(dimethylamino)propyl ether, wherein R is  $\text{CH}_2-\text{CH}(\text{OH})-\text{CH}_2-\text{N}(\text{CH}_3)_2$  which is cationic at low pH; quaternary ammonium, e.g., 2-hydroxy-3-(trimethylammonio)propyl ether chloride groups, wherein R is  $\text{CH}_2-\text{CH}(\text{OH})-\text{CH}_2-\text{N}^+(\text{CH}_3)_3\text{Cl}^-$ ; anionic cyclodextrins such as carboxymethyl cyclodextrins, cyclodextrin sulfates, and cyclodextrin succinylates; amphoteric cyclodextrins such as

carboxymethyl/quaternary ammonium cyclodextrins; cyclodextrins wherein at least one glucopyranose unit has a 3-6-anhydro-cyclomalto structure, e.g., the mono-3-6-anhydrocyclodextrins, as disclosed in "Optimal Performances with Minimal Chemical Modification of Cyclodextrins", F. Diedaini-Pilard and B. Perly, The 7th International Cyclodextrin Symposium Abstracts, April 1994, p. 49, said references being incorporated herein by reference; and mixtures thereof. Other cyclodextrin derivatives are disclosed in U.S. Pat. Nos.: 3,426,011, Parmerter et al., issued Feb. 4, 1969; 3,453,257; 3,453,258; 3,453,259; and 3,453,260, all in the names of Parmerter et al., and all issued July 1, 1969; 3,459,731, Gramera et al., issued Aug. 5, 1969; 3,553,191, Parmerter et al., issued Jan. 5, 1971; 3,565,887, Parmerter et al., issued Feb. 23, 1971; 4,535,152, Szejtli et al., issued Aug. 13, 1985; 4,616,008, Hirai et al., issued Oct. 7, 1986; 4,678,598, Ogino et al., issued Jul. 7, 1987; 4,638,058, Brandt et al., issued Jan. 20, 1987; and 4,746,734, Tsuchiyama et al., issued May 24, 1988; all of said patents being incorporated herein by reference.

Highly water-soluble cyclodextrins are those having water solubility of at least about 10g in 100 ml of water at room temperature, preferably at least about 20 g in 100 ml of water, more preferably at least about 25 g in 100 ml of water at room temperature. The availability of solubilized, uncomplexed cyclodextrins is essential for effective and efficient odor control performance. Solubilized, water-soluble cyclodextrin can exhibit more efficient odor control performance than non-water-soluble cyclodextrin when deposited onto surfaces.

Examples of preferred water-soluble cyclodextrin derivatives suitable for use herein are hydroxypropyl alpha-cyclodextrin, methylated alpha-cyclodextrin, methylated beta-cyclodextrin, hydroxyethyl beta-cyclodextrin, and hydroxypropyl beta-cyclodextrin. Hydroxyalkyl cyclodextrin derivatives preferably have a degree of substitution of from about 1 to about 14, more preferably from about 1.5 to about 7, wherein the total number of OR groups per cyclodextrin is defined as the degree of substitution. Methylated cyclodextrin derivatives typically have a degree of substitution of from about 1 to about 18, preferably from about 3 to about 16. A known methylated beta-cyclodextrin is heptakis-2,6-di-O-methyl- $\beta$ -cyclodextrin, commonly known as DIMEB, in which each glucose unit has about 2 methyl groups with a degree of substitution of about 14. A preferred, more commercially available, methylated beta-cyclodextrin is a randomly methylated beta-cyclodextrin, commonly known as RAMEB, having different degrees of substitution, normally of about 12.6. RAMEB is more preferred than DIMEB, since DIMEB affects the surface activity of the preferred surfactants more than RAMEB. The preferred cyclodextrins are available, e.g., from Cerestar USA, Inc. and Wacker Chemicals (USA), Inc.

It may also be preferable to use a mixture of cyclodextrins in the cleaning component. Such mixtures absorb odors more broadly by complexing with a wider range of odoriferous molecules having a wider range of molecular sizes. Preferably at least a portion of the cyclodextrin is alpha-cyclodextrin and/or its derivatives, gamma-cyclodextrin and/or its derivatives, and/or derivatised beta-cyclodextrin, more preferably a mixture of alpha-

cyclodextrin, or an alpha-cyclodextrin derivative, and derivatised beta-cyclodextrin, even more preferably a mixture of derivatised alpha-cyclodextrin and derivatised beta-cyclodextrin, most preferably a mixture of hydroxypropyl alpha-cyclodextrin and hydroxypropyl beta-cyclodextrin, and/or a mixture of methylated alpha-cyclodextrin and methylated beta-cyclodextrin.

In certain embodiments, it is preferable that the cleaning component of the present invention contain low levels of cyclodextrin so that no visible residue appears at normal usage levels. Preferably, the cleaning component used to treat the surface under usage conditions is virtually not discernible when dry. Typical levels of cyclodextrin in usage compositions for usage conditions are from about 0.01% to about 1%, preferably from about 0.05% to about 0.75%, more preferably from about 0.1% to about 0.5% by weight of the cleaning component. Components with higher concentrations can leave unacceptable visible residues.

#### Peroxide Sources

The cleaning component of the present articles can contain peroxide such as hydrogen peroxide, or a source of hydrogen peroxide, for further disinfectancy, fungistatic and fungicidal benefits. The ingredients of the cleaning component are substantially compatible with the use of peroxides. Preferred peroxides include benzoyl peroxide and hydrogen peroxide. These can optionally be present in the compositions herein in levels of from about 0.05% to about 5%, more preferably from about 0.1% to about 3%, most preferably from about 0.2% to about 1.5%.

When peroxide is present, it is desirable to provide a stabilizing system. Suitable stabilizing systems are known. A preferred stabilizing system consists of radical scavengers and/or metal chelants present at levels of from about 0.01% to about 0.5%, more preferably from about 0.01% to about 0.25%, most preferably from about 0.01% to about 0.1%, by weight of the cleaning component. Examples of radical scavengers include anti-oxidants such as propyl gallate, butylated hydroxy toluene (BHT), butylated hydroxy anisole (BHA) and the like. Examples of suitable metal chelants include diethylene triamine penta-acetate, diethylene triamine penta-methylene phosphonate, hydroxyethyl diphosphonate and the like.

#### Thickening Polymer

Low levels of polymer can also be used to thicken the cleaning component of the present invention. In general, the level of thickening polymer is kept as low as possible so as not to hinder the product's end result properties. Xanthan gum is a particularly preferred thickening agent as it can also enhance end result properties, particularly when used in low concentrations. The thickening polymer agent is present in from about 0.001% to about 0.1%, more preferably from about 0.0025% to about 0.05%, most preferably from about 0.005% to about 0.025% by weight of the cleaning component.

#### Aqueous Solvent System

The cleaning components which are aqueous, comprise at least about 80% aqueous solvent by weight of the component, more preferably from about 80% to over 99% by weight of the component. The aqueous components are typically in micellar form, and do not incorporate substantial levels of water insoluble components that induce significant micellar swelling.

The aqueous solvent system can also comprise low molecular weight, highly water soluble solvents typically found in detergent compositions, e.g., ethanol, isopropanol, etc. These solvents can be used to provide disinfectancy properties to components that are otherwise low in active. Additionally, they can be particularly useful in components wherein the total level of perfume is very low. In effect, highly volatile solvents can provide "lift", and enhance the character of the perfume. Highly volatile solvents, if present are typically present in from about 0.25% to about 5%, more preferably from about 0.5% to about 3%, most preferably from about 0.5% to about 2%, by weight of the component. Examples of such solvents include methanol, ethanol, isopropanol, *n*-butanol, *iso*-butanol, 2-butanol, pentanol, 2-methyl-1-butanol, methoxymethanol, methoxyethanol, methoxy propanol, and mixtures thereof.

The cleaning components of the present invention can also include other solvents, and in particular paraffins and isoparaffins, which can substantially reduce the suds created by the component.

#### Suds Suppressor

Suitable silicone suds suppressors for use herein include any silicone and silica-silicone mixtures. Silicones can be generally represented by alkylated polysiloxane materials while silica is normally used in finely divided forms exemplified by silica aerogels and xerogels and hydrophobic silicas of various types. In industrial practice, the term "silicone" has become a generic term which encompasses a variety of relatively high-molecular-weight polymers containing siloxane units and hydrocarbyl groups of various types. Indeed, silicone compounds have been extensively described in the art, see for instance United States Patents: US 4,076,648; US 4,021,365; US 4,749,740; US 4,983,316 and European Patents: EP 150,872; EP 217,501; and EP 499,364, all of said patents being incorporated herein by reference. Preferred are polydiorganosiloxanes such as polydimethylsiloxanes having trimethylsilyl end blocking units and having a viscosity at 25°C of from  $5 \times 10^{-5}$  m<sup>2</sup>/s to 0.1 m<sup>2</sup>/s, i.e. a value of *n* in the range 40 to 1500. These are preferred because of their ready availability and their relatively low cost.

A preferred type of silicone compounds useful in the cleaning component herein comprises a mixture of an alkylated siloxane of the type hereinabove disclosed and solid silica. The solid silica can be a fumed silica, a precipitated silica or a silica made by the gel formation technique. The silica particles can be rendered hydrophobic by treating them with dialkylsilyl groups and/or trialkylsilane groups either bonded directly onto the silica or by means of silicone resin. A preferred silicone compound comprises a hydrophobic silanated, most preferably trimethylsilanated silica having a particle size in the range from 10 nm to 20 nm and a specific surface area above 50 m<sup>2</sup>/g. Silicone compounds employed in the compositions according to the present invention suitably have an amount of silica in the range of 1 to 30% (more preferably 2.0 to 15%) by weight of the total weight of the silicone compounds resulting in silicone compounds having an average viscosity in the range of from  $2 \times 10^{-4}$  m<sup>2</sup>/s to 1 m<sup>2</sup>/s. Preferred silicone compounds can have a viscosity in the range of from  $5 \times 10^{-3}$  m<sup>2</sup>/s to

0.1m<sup>2</sup>/s. Particularly suitable are silicone compounds with a viscosity of  $2 \times 10^{-2}$ m<sup>2</sup>/s or  $4.5 \times 10^{-2}$ m<sup>2</sup>/s.

Suitable silicone compounds for use herein are commercially available from various companies including Rhone Poulenc, Fueller and Dow Corning. Examples of silicone compounds for use herein are Silicone DB® 100 and Silicone Emulsion 2-3597® both commercially available from Dow Corning.

#### Perfume

One or more perfumes may also be included in the cleaning component of the present articles. As used herein, perfume includes constituents of a perfume that are added primarily for their olfactory contribution, often complimented by use of a volatile organic solvent such as ethanol.

Most hard surface cleaner products contain some perfume to provide an olfactory aesthetic benefit and to cover any "chemical" odor that the product may have. The main function of a small fraction of the highly volatile, low boiling (having low boiling points), perfume components in these perfumes is to improve the fragrance odor of the product itself, rather than impacting on the subsequent odor of the surface being cleaned. However, some of the less volatile, high boiling perfume ingredients can provide a fresh and clean impression to the surfaces, and it is sometimes desirable that these ingredients be deposited and present on the dry surface.

The perfumes are preferably those that are more water-soluble and/or volatile to minimize spotting and filming. The perfumes useful herein are described in more detail in U.S. Patent 5,108,660, Michael, issued April 28, 1992, at col. 8 lines 48 to 68, and col. 9 lines 1 to 68, and col. 10 lines 1 to 24, said patent, and especially said specific portion, being incorporated by reference.

Perfume components can be natural products such as essential oils, absolutes, resinoids, resins, concretes, etc., and/or synthetic perfume components such as hydrocarbons, alcohols, aldehydes, ketones, ethers, acids, acetals, ketals, nitriles, etc., including saturated and unsaturated compounds, aliphatic, carbocyclic and heterocyclic compounds. Examples of such perfume components are: geraniol, geranyl acetate, linalool, linalyl acetate, tetrahydrolinalool, citronellol, citronellyl acetate, dihydromyrcenol, dihydromyrcenyl acetate, terpineol, terpinyl acetate, acetate, 2-phenylethanol, 2-phenylethyl acetate, benzyl alcohol, benzyl acetate, benzyl salicylate, benzyl benzoate, styrallyl acetate, amyl salicylate, dimethylbenzylcarbinol, trichloromethylphenylcarbinyl acetate, p-tert.butyl-cyclohexyl acetate, isononyl acetate, alpha-n-amylocinammic aldehyde, alpha-hexyl-cinammic aldehyde, 2-methyl-3-(p-tert.butylphenyl)propanal, 2-methyl-3(p-isopropylphenyl)propanal, 3-(p-tert.butylphenyl)propanal, tricyclodecenyl acetate, tricyclodecenyl propionate, 4-(4-hydroxy-4-methylpentyl)-3-cyclohexenecarbaldehyde, 4-(4-methyl-3-pentenyl)-3cyclohexenecarbaldehyde, 4-acetoxy-3-pentyl-tetrahydropyran, methyl dihydrojasmonate, 2-n-heptyl-cyclopentanone, 3-methyl-2-pentyl-cyclopentanone, n-decanal, n-dodecanal, 9-decenol-1, phenoxyethyl isobutyrate,

phenylacetaldehyde dimethyl acetal, phenylacetaldehyde dicetyl acetal, geranonitrile, citronellonitrile, cedryl acetate, 3-isocamphyl-cyclohexanol, cedryl ether, isolongifolanone, aubepine nitrile, aubepine, heliotropine, coumarin, eugenol, vanillin, diphenyl oxide, hydroxycitronellal, ionones, methyl ionones, isomethyl ionones, irones, cis-3-hexenol and esters thereof, indane musks, tetralin musks, isochroman musks, macrocyclic ketones, macrolactone musks, ethylene brassylate, aromatic nitromusk. A cleaning component herein typically comprises from 0.1% to 2% by weight of the cleaning component, of a perfume ingredient, or mixtures thereof, preferably from 0.1% to 1%. In the case of the preferred embodiment containing peroxide, the perfumes must be chosen so as to be compatible with the oxidant.

In one execution, the perfume ingredients of the cleaning component are hydrophobic and highly volatile, e.g., ingredients having a boiling point of less than about 260°C, preferably less than about 255°C; and more preferably less than about 250°C, and a ClogP of at least about 3, preferably more than about 3.1, and even more preferably more than about 3.2.

The logP of many ingredients has been reported; for example, the Pomona92 database, available from Daylight Chemical Information Systems, Inc. (Daylight CIS), Irvine, California, contains many, along with citations to the original literature. However, the logP values are most conveniently calculated by the "CLOGP" program, also available from Daylight CIS. This program also lists experimental logP values when they are available in the Pomona92 database. The "calculated logP" (ClogP) is determined by the fragment approach of Hansch and Leo (cf., A. Leo, in Comprehensive Medicinal Chemistry, Vol. 4, C. Hansch, P. G. Sammens, J. B. Taylor and C. A. Ramsden, Eds., p. 295, Pergamon Press, 1990, incorporated herein by reference). The fragment approach is based on the chemical structure of each ingredient, and takes into account the numbers and types of atoms, the atom connectivity, and chemical bonding. The ClogP values, which are the most reliable and widely used estimates for this physicochemical property, are preferably used instead of the experimental logP values in the selection of the principal solvent ingredients which are useful in the present invention. Other methods that can be used to compute ClogP include, e.g., Crippen's fragmentation method as disclosed in J. Chem. Inf. Comput. Sci., 27, 21 (1987); Viswanadhan's fragmentation method as disclosed in J. Chem. Inf. Comput. Sci., 29, 163 (1989); and Broto's method as disclosed in Eur. J. Med. Chem.- Chim. Theor., 19, 71 (1984).

#### Detergency Builders

Detergent builders that are efficient for hard surface cleaners and have reduced filming/streaking characteristics at the critical levels may also be included in the cleaning component. Preferred detergent builders are the carboxylic acid detergent builders described hereinbefore as part of the polycarboxylic acid disclosure, including citric and tartaric acids. Tartaric acid improves cleaning and can minimize the problem of filming/streaking that usually occurs when detergent builders are added to hard surface cleaners.

The detergent builder is present at levels that provide detergent building, and, those that are not part of the acid pH adjustment described hereinbefore, are typically present at a level of

from about 0.01% to about 0.3%, more preferably from about 0.005% to about 0.2%, and most preferably from about 0.05% to about 0.1%, by weight of the cleaning component.

#### Buffers

The cleaning component of the present article can also contain other various adjuncts that are known to the art for detergent compositions. Preferably they are not used at levels that cause unacceptable filming/streaking. Buffers are an important class of adjuncts in this application. This occurs mainly as a result of the low levels of active employed. An ideal buffer system will maintain pH over a desired narrow range, while not leading to streaking/filming issues. Preferred buffers in the context of the invention are those which are highly volatile, yet can provide cleaning benefits in use. As such, they are advantageous in that they can be used at higher levels than corresponding buffers that are less volatile. Such buffers tend to have low molecular weight, i.e., less than about 150 g/mole and generally contain no more than one hydroxy group. Examples of preferred buffers include ammonia, methanol amine, ethanol amine, 2-amino-2-methyl-1-propanol, 2-dimethylamino-2-methyl-1-propanol, acetic acid, glycolic acid and the like. Most preferred among these are ammonia, 2-dimethylamino-2-methyl-1-propanol and acetic acid. When used, these buffers are present in from about 0.005% to about 0.5%, with the higher levels being more preferred for the more volatile chemicals.

Non-volatile buffers can also be used in this invention. Such buffers must be used at generally lower levels than the preferred levels because of increased streaking/filming tendencies. Examples of such buffers include, but are not limited to, sodium carbonate, potassium carbonate and bicarbonate, 1,3-bis(aminomethyl) cyclohexane, sodium citrate, citric acid, maleic acid, tartaric acid, and the like. Maleic acid is particularly preferred as a buffer because of its tendency not to induce surface damage. Citric acid is also desirable since it provides anti-microbial benefits as a registered EPA active. Additionally, in cleaning components comprising hydrophilic polymers, acidity has been found to promote better wetting and provide longer lasting "sheeting" effects, particularly when the present articles are used for daily shower cleaning. When used, non-volatile buffers are present in from about 0.001% to about 0.05% by weight of the composition.

Non-limiting examples of other adjuncts are: enzymes such as proteases; hydrotropes such as sodium toluene sulfonate, sodium cumene sulfonate and potassium xylene sulfonate; thickeners other than the hydrophilic polymers at a level of from about 0.01% to about 0.5%, preferably from about 0.01% to about 0.1%; and aesthetic-enhancing ingredients such as colorants, providing they do not adversely impact on filming/streaking.

#### Preservatives and Antibacterial agents

Preservatives can also be used, and may be required in many of the benefit components of the articles intended for household care use, especially those articles which contain high levels of water. Examples of preservatives include bronopol, hexitidine sold by Angus chemical (211 Sanders Road, Northbrook, Illinois, USA). Other preservatives include Kathon, 2-((hydroxymethyl) (amino)ethanol, propylene glycol, sodium hydroxymethyl amino acetate,

formaldehyde and glutaraldehyde, dichloro-s-triazinetriene, trichloro-s-triazinetriene, and quaternary ammonium salts including dioctyl dimethyl ammonium chloride, didecyl dimethyl ammonium chloride, C<sub>12</sub>, C<sub>14</sub> and C<sub>16</sub> dimethyl benzyl. Preferred preservatives include 1,2-benzisothiazolin-3-one and polyhexamethylene biguanide sold by Avicia Chemicals (Wilmington, Delaware 19897) and chlorhexidine diacetate sold by Aldrich-Sigma (1001 West Saint Paul Avenue, Milwaukee, WI 53233), sodium pyrithione sold by Arch Chemicals (501 Merritt Seven, P.O. Box 5204, Norwalk CT 06856) sold by Arch Chemicals. When used, preservatives are preferentially present at concentrations of from about 0.0001% to about 0.01%. These same preservatives can function to provide antibacterial control on the surfaces, but typically will require use at higher levels from about 0.005 to about 0.1%. Other antibacterial agents, including quaternary ammonium salts, can be present, but are not preferred in the context of the present invention at high levels, i.e., at levels greater than about 0.05%. Such compounds have been found to often interfere with the benefits of the preferred polymers. In particular, quaternary ammonium surfactants tend to hydrophobically modify hard surfaces. Thus, the preferred polymers are found to be ineffective in compositions comprising significant concentrations of quaternary ammonium surfactants. Similar results have been found using amphoteric surfactants, including lauryl betaines and coco amido betaines. When present, the level of cationic or amphoteric surfactant should be at levels below about 0.1%, preferably below about 0.05%. More hydrophobic antibacterial/germicidal agents, like orthobenzyl-para-chlorophenol, are avoided. If present, such materials should be kept at levels below about 0.05%.

#### ADDITIONAL COMPONENTS SUITABLE FOR INCLUSION INTO ANY ARTICLES OF THE PRESENT INVENTION

##### Additional Layers

In certain embodiments, the article of the present invention may comprise one or more additional layers which one having ordinary skill in the art would recognize as separate and distinct from the laminate web. Such additional layers may aid in the effectiveness of the article by supplementing the substantivity of the article. In the personal care context, the additional layers are suitable for enhancing the soft feel of the side of the article that contacts the area to be cleansed and/or conditioned. Suitable additional layers include any of the materials discussed above as suitable layers of the laminate web.

Nonwovens are preferred additional layers for the present invention. Suitable nonwovens made from synthetic materials useful in the present invention can be obtained from a wide variety of commercial sources. Nonlimiting examples of suitable materials useful herein for the layers of the laminate web include HEF 40-047, an apertured hydroentangled material containing about 50% rayon and 50% polyester, and having a basis weight of about 61 grams per square meter (gsm), available from Veratec, Inc., Walpole, MA; HEF 140-102, an apertured hydroentangled material containing about 50% rayon and 50% polyester, and having a basis weight of about 67 gsm, available from Veratec, Inc., Walpole, MA; Novonet® 149-616, a

thermo-bonded grid patterned material containing about 100% polypropylene, and having a basis weight of about 60 gsm available from Veratec, Inc., Walpole, MA; Novonet® 149-801, a thermo-bonded grid patterned material containing about 69% rayon, about 25% polypropylene, and about 6% cotton, and having a basis weight of about 90 gsm, available from Veratec, Inc. Walpole, MA; Novonet® 149-191, a thermo-bonded grid patterned material containing about 69% rayon, about 25% polypropylene, and about 6% cotton, and having a basis weight of about 120 gsm, available from Veratec, Inc. Walpole, MA; HEF Nubtex® 149-801, a nubbed, apertured hydroentangled material, containing about 100% polyester, and having a basis weight of about 84 gsm, available from Veratec, Inc. Walpole, MA; Keybak® 951V, a dry formed apertured material, containing about 75% rayon, about 25% acrylic fibers, and having a basis weight of about 51 gsm, available from Chicopee, New Brunswick, NJ; Keybak® 1368, an apertured material, containing about 75% rayon, about 25% polyester, and having a basis weight of about 47 gsm, available from Chicopee, New Brunswick, NJ; Duralace® 1236, an apertured, hydroentangled material, containing about 100% rayon, and having a basis weight from about 48 gsm to about 138 gsm, available from Chicopee, New Brunswick, NJ; Duralace® 5904, an apertured, hydroentangled material, containing about 100% polyester, and having a basis weight from about 48 gsm to about 138 gsm, available from Chicopee, New Brunswick, NJ; Chicopee® 5763, a carded hydroapertured material (8x6 apertures per inch, 3X2 apertures per cm), containing about 70% rayon, about 30% polyester, and optionally a latex binder (Acrylate or EVA based) of up to about 5% w/w, and having a basis weight from about 60 gsm to about 90 gsm, available from Chicopee, New Brunswick, NJ; Chicopee® 9900 series (e.g., Chicopee 9931, 62 gsm, 50/50 rayon/polyester, and Chicopee 9950 50 gsm, 50/50 rayon/polyester), a carded, hydroentangled material, containing a fiber composition of from 50% rayon/50% polyester to 0% rayon/100% polyester or 100% rayon/0% polyester, and having a basis weight of from about 36 gsm to about 84 gsm, available from Chicopee, New Brunswick, NJ; Sontara 8868, a hydroentangled material, containing about 50% cellulose and about 50% polyester, and having a basis weight of about 72 gsm, available from Dupont Chemical Corp. Preferred non-woven substrate materials have a basis weight of about from 24 gsm to about 96 gsm, more preferably from about 36 gsm to about 84 gsm, and most preferably from about 42 gsm to about 78 gsm.

Additional layer may also comprise a polymeric mesh sponge as described in European Patent Application No. EP 702550A1 published March 27, 1996, which is incorporated by reference herein in its entirety. Such polymeric mesh sponges comprise a plurality of plies of an extruded tubular netting mesh prepared from nylon or a strong flexible polymer, such as addition polymers of olefin monomers and polyamides of polycarboxylic acids.

The additional layer may also comprise formed films and composite materials, i.e., multiple materials containing formed films. Preferably, such formed films comprise plastics which tend to be soft to the skin. Suitable soft plastic formed films include, but are not limited

to, polyolefins such as low density polyethylenes (LDPE). In such cases where the additional layer comprises a plastic formed film, it is preferred that the layer be apertured, e.g., macroapertured or microapertured, such that the layer is fluid permeable. In one embodiment, the layer comprises a plastic formed film which is only microapertured. In another embodiment, the additional layer comprises a plastic formed film which is both microapertured and macroapertured. In such embodiments, the layer is well-suited to contact the area to be cleansed and/or therapeutically treated given the cloth-like feel of such microapertured films. Preferably, in such an embodiment, the surface aberrations of the microapertures face opposite of the surface aberrations of the macroapertures on the additional layer. In such an instance, it is believed that the macroapertures maximize the overall wetting/lathering of the article by the three-dimensional thickness formed from the surface aberrations which are under constant compression and decompression during the use of the article thereby creating lathering bellows.

In any case, the additional layer comprising a formed film preferably has at least about 100 apertures/cm<sup>2</sup>, more preferably at least 500 apertures/cm<sup>2</sup>, even still more preferably at least about 1000 apertures/cm<sup>2</sup>, and most preferably at least about 1500 apertures/cm<sup>2</sup> of the substrate. More preferred embodiments of the present invention include a nonwoven layer which has water flux rate of from about 5 cm<sup>3</sup>/cm<sup>2</sup>-s to about 70 cm<sup>3</sup>/cm<sup>2</sup>-s, more preferably from about 10 cm<sup>3</sup>/cm<sup>2</sup>-s to about 50 cm<sup>3</sup>/cm<sup>2</sup>-s and most preferably from about 15 cm<sup>3</sup>/cm<sup>2</sup>-s to about 40 cm<sup>3</sup>/cm<sup>2</sup>-s.

Suitable formed films and formed film-containing composite materials useful in the nonwoven layer of the present invention include, but are not limited to, those disclosed in U. S. Patent No. 4,342,314 issued to Radel et al. on August 3, 1982, commonly assigned co-pending application U. S. Serial No. 08/326,571 and PCT Application No. US95/07435, filed June 12, 1995 and published January 11, 1996, and U. S. Patent No. 4,629,643, issued to Curro et al. on December 16, 1986, each of which is incorporated by reference herein in its entirety. Furthermore, the nonwoven layer may be a formed film composite material comprising at least one formed film and at least one nonwoven wherein the layer is vacuum formed. A suitable formed film composite material includes, but is not limited to, a vacuum laminated composite formed film material formed by combining a carded polypropylene nonwoven having a basis weight of 30 gsm with a formed film.

Another preferred material suitable for an additional layer is batting. Preferably, such batting comprises synthetic materials. As used herein, "synthetic" means that the materials are obtained primarily from various man-made materials or from natural materials that have been further altered. Suitable synthetic materials include, but are not limited to, acetate fibers, acrylic fibers, cellulose ester fibers, modacrylic fibers, polyamide fibers, polyester fibers, polyolefin fibers, polyvinyl alcohol fibers, rayon fibers, polyethylene foam, polyurethane foam, and combinations thereof. Preferred synthetic materials, particularly fibers, may be selected from the group consisting of nylon fibers, rayon fibers, polyolefin fibers, polyester fibers, and combinations thereof. Preferred polyolefin fibers are fibers selected from the group consisting

of polyethylene, polypropylene, polybutylene, polypentene, and combinations and copolymers thereof. More preferred polyolefin fibers are fibers selected from the group consisting of polyethylene, polypropylene, and combinations and copolymers thereof. Preferred polyester fibers are fibers selected from the group consisting of polyethylene terephthalate, polybutylene terephthalate, polycyclohexylenedimethylene terephthalate, and combinations and copolymers thereof. More preferred polyester fibers are fibers selected from the group consisting of polyethylene terephthalate, polybutylene terephthalate, and combinations and copolymers thereof. Most preferred synthetic fibers comprise solid staple polyester fibers that comprise polyethylene terephthalate homopolymers. Suitable synthetic materials may include solid single component (i.e., chemically homogeneous) fibers, multiconstituent fibers (i.e., more than one type of material making up each fiber), and multicomponent fibers (i.e., synthetic fibers which comprise two or more distinct filament types which are somehow intertwined to produce a larger fiber), and combinations thereof. Preferred fibers include bicomponent fibers, multiconstituent fibers, and combinations thereof. Such bicomponent fibers may have a core-sheath configuration or a side-by-side configuration. In either instance, the batting may comprise either a combination of fibers comprising the above-listed materials or fibers which themselves comprise a combination of the above-listed materials.

For the core-sheath fibers, preferably, the cores comprise materials selected from the group consisting of polyesters, polyolefins having a  $T_g$  of at least about 10°C higher than the sheath material, and combinations thereof. Conversely, the sheaths of the bicomponent fibers preferably comprise materials selected from the group consisting of polyolefins having a  $T_g$  of at least about 10°C lower than the core material, polyesters polyolefins having a  $T_g$  of at least about 10°C lower than the core material, and combinations thereof.

In any instance, side-by side configuration, core-sheath configuration, or solid single component configuration, the fibers of the batting may exhibit a helical or spiral or crimped configuration, particularly the bicomponent type fibers.

#### METHODS OF CLEANSING, CONDITIONING, DELIVERING A COSMETIC, POLISHING/DUSTING, AND CLEANING A SURFACE IN NEED OF SUCH TREATMENT

The present invention relates to methods of cleansing and/or conditioning the skin or hair with a personal care article of the present invention. The present invention further relates to methods of delivering a cosmetic agent to the skin and/or hair. The present invention also relates to household uses such as polishing/dusting or cleaning a hard surface in need of such treatment. Each of these methods comprise the steps of: a) optionally, wetting with water a substantially dry disposable article of the present invention and b) contacting a surface in need of treatment with the wetted article in a wiping or rubbing motion.

#### EXAMPLES

The following examples further describe and demonstrate embodiments within the scope of the present invention. In the following examples, all ingredients are listed at an active level. The examples are given solely for the purpose of illustration and are not to be construed as

limitations of the present invention, as many variations thereof are possible without departing from the spirit and scope of the invention.

Ingredients are identified by chemical or CTFA name.

#### I. Cleansing Components

##### Example 1

Prepare a representative cleansing component for the articles of the present invention in the following manner.

Shave 53.0 gms of a bar soap which includes the following ingredients:

Ingredients	Wt %
Sodium Cocyl Isethionate	27.77
Paraffin	16.72
Sodium Alkyl Glycerol Sulfonate (AGS)	14.90
Soaps	11.41
Glycerine	8.57
Water	5.50
Stearic Acid	5.74
Sodium Isethionate	3.04
NaCl	1.41
EDTA	0.10
Etidronic Acid	0.10
Polyox	0.03
Perfume	0.70
Miscellaneous (including pigments)	4.01
Total	100

Mix the bar soap shavings with 37.0 gms glycerin (99.7%), 9.5 gms water, and 0.5 gms perfume. Heat mixture to 200 °F while stirring continuously. Cold-mill mixture on a standard 3-roll mill and store cleansing component in a suitable sealed container.

##### Example 2

Prepare a representative cleansing component for the articles of the present invention in the following manner.

Shave 40.0 gms of a bar soap which includes the following ingredients:

Ingredients	Wt %
Sodium Soap	52.40
Sodium Alkyl Glycerol Sulfonate (AGS)	16.50
Magnesium Soap	13.40
Glycerine	0.19
Water	5.50
Stearic Acid	1.60
Sodium Isethionate	3.00
NaCl	3.89
EDTA	0.10
Etidronic Acid	0.10
Perfume	0.70
Miscellaneous (including pigments)	2.62
Total	100

Mix the bar soap shavings with 45.0 gms glycerin (99.7%), 4.5 gms water, and 0.5 gms perfume. Heat mixture to 200°F while stirring continuously. Cold-mill mixture on a standard 3-roll mill and store cleansing component in a suitable sealed container.

Example 3

Prepare a representative powdery cleansing component for the articles of the present invention in the following manner.

Shave 40.0 gms of a bar soap which includes the following ingredients:

Ingredients	Wt %
Soap (Magnesium and Sodium)	80.16
Water	11.50
Stearic Acid	5.70
NaCl	1.10
EDTA	0.25
Perfume	1.15
Miscellaneous (including pigments)	0.14
Total	100

Store the bar soap flakes in a suitable sealed container.

Example 4

Prepare a representative powdery cleansing component for the articles of the present invention in the following manner.

Shave 40.0 gms of a bar soap which includes the following ingredients:

Ingredients	Wt %
Soap (Magnesium and Sodium)	80.16
Water	11.50
Stearic Acid	5.70
NaCl	1.10
EDTA	0.25
Perfume	1.15
Miscellaneous (including pigments)	0.14
Total	100

Blend the bar soap flakes with sodium bicarbonate in a 90:10 weight ratio. Mill the mixture twice in a standard 3-roll mill. Collect the flakes and store in a suitable sealed container.

Example 5

Prepare a representative cleansing component for the articles of the present invention in the following manner. Blend the cleansing component of Example 2 with 0.1% by weight of the bar soap flakes of a protease enzyme. Next, blend the resultant mixture with 2% by weight of the cleansing component of a dry hydrocolloid, sodium carboxymethylcellulose, and mill. Store the enzyme-containing cleansing component in a suitable sealed container.

Example 6

Prepare a representative liquid cleansing component which includes the following ingredients.

Ingredients	Wt%
Sodium coconut alkyl glyceryl sulfonate (AGS)	7.2
Ammonium lauryl sulfate (ALS)	10.4
Alkyl laureth sulfate (AE3S)	10.4

Poly(ethylene oxide) (PolyOx WSR N-3000, Union Carbide)	0.5
Xanthan gum	1.4
Water	70.1

Example 7

Prepare a representative cleansing component for the articles of the present invention in the following manner. Heat 3 lbs of soap shavings of Example 2 with  $\frac{3}{4}$  cup of isopropyl alcohol (99%) until the soap is melted. When the soap has melted, add the remaining alcohol. Add 10 oz. table sugar dissolved in as little water as possible. Blend about 4 tsp. of a dye into 8 oz. glycerin. Add the glycerin (99.7%). Stir. Continue to heat until consistency changes from a thin liquid to rope-like ribbons falling off the stirring implement and an aliquot of material hardens when dropped on a cold surface. Pour the mixture into a suitable container to harden. The mixture has the advantage of being remeltable upon heating which allows easy processing to prepare articles.

Example 8

Prepare a representative tear-free liquid cleansing component that includes the following ingredients.

Ingredients	Wt%
Cocamido propyl betaine	17.1
Sodium trideceth sulfate	8.3
POE 100 sorbitan monooleate	7.5
Misc. (including perfume, preservative, dye)	2.0
Water	65.1

Distinguishing characteristics of this composition are its non-irritating properties to skin and eyes.

Example 9

Prepare a representative liquid cleansing component that includes the following ingredients.

Ingredients	Wt%
Polyquaternium 10	0.50
Sodium Lauroamphoacetate	5.4
Sodium Laureth 3 Sulfate	11.6
Disodium EDTA	0.20
Sodium citrate dihydrate	0.50
Citric acid, anhydrous	1.0
PEG-6 caprylic/capric glycerides	2.0
Cocamide MEA	2.0
Glycerin	3.5
MgSO <sub>4</sub> ·7H <sub>2</sub> O (Epsom salts)	1.5
Maleated Soybean Oil	2.5
Deodorized Soybean Oil	5.0
Misc. (including perfume, caustic, colorant)	1.5
Water	62.8

The mixture is mild for use on sensitive skin.

**Example 10**

Prepare a representative liquid cleansing component by mixing the following ingredients.

Ingredients	Wt%
Polyquaternium-10	0.1
Sodium sulfate	1.5
Lauryl alcohol	0.3
Sodium laureth sulfate	5.8
Citric acid, anhydrous	0.2
Cocamidopropyl betaine	15.5
Sodium lauroyl sarcosinate	1.5
Misc. (including perfume, blue colorant)	1.0
Water	74.1

**Example 11**

Prepare a representative cleansing component by mixing the following ingredients.

Ingredients	Wt%
Decylpolyglucose	14.7
Cocamidopropyl betaine	14.7
Sodium lauroyl sarcosinate	14.7
Polyquaternium-10	1.1
Perfume	1.0
Titanium Dioxide	0.5
Sodium Benzoate	0.3
Citric Acid	0.3
Disodium EDTA	0.1
Water	52.6

**Example 12**

Prepare a representative cleansing component which includes the following ingredients.

Ingredients	Wt%
EGDS	3.1
Cocamidopropyl betaine	4.0
TEA soap (Molecular Weight about 330)	9.5
Monoalkyl phosphate	15.0
Cocamine oxide	7.5
1,2-propanediol	1.0
Ethanol	3.0
Miscellaneous (perfume, colorant, preservative)	8.9
Water	48.0

Heat the mixture to 50 degrees Celsius, stirring continuously, until the mixture has lost 38% of its original weight, and it has a paste-like consistency. The paste advantageously is easy to process with substrate layers and requires no further drying.

**Example 13**

Prepare a representative cleansing component which includes the following ingredients.

Ingredients	Wt%
SEFA* Cottonate	57.5
Citric acid	0.30
Cocamidopropyl betaine	3.5

Sodium lauroyl sarcosinate	10.7
Ethylene vinyl acetate polymer (Elvax 40W)	8.0
Silicone polymer microbeads (Tospearly 145A)	20.0

\*SEFA is an acronym for sucrose esters of fatty acids

Melt the ethylene vinyl acetate polymer into the SEFA cottonate at 90 degrees Celsius and high shear mix. Add the surfactant powders and citric acid and mix. Add the silicone polymer microbeads, mix, and cool to set. The composition is remeltable and easy impregnate into or coat onto substrate layers.

#### Example 14

Prepare a representative cleansing component which includes the following components.

Ingredients	Wt%
Sodium laureth-10 carboxylate (Empicol CB5S*)	50.0
CI2-14, 12EO Alcohol Ethoxylate (Empilan KB12*)	50.0

\*available from Albright & Wilson

Melt alcohol ethoxylate. Blend in the carboxylate until homogeneous. Next, cool the mixture to solidify until ready for use. The composition is remeltable and easy impregnate into or coat onto cloths.

#### Example 15

Prepare a representative cleansing component which includes the following ingredients.

Ingredients	Wt%
CI6-18, 150EO Alcohol Ethoxylate (Empilan KM50*)	22.0
Cocamidopropyl betaine (Empigen BS)*	20.0
MEA Laureth-3 ethoxylate sulphate (Marlinat MEA)	20.0
Citric Acid anhydrous	0.15
Sodium Lauroyl sarcosinate	20.0
Propylene glycol	17.85

\*available from Albright & Wilson

Heat the mixture to 70°C, stirring continuously until it has a paste like consistency. Cool to solidify until ready to use.

#### Example 16

Prepare a representative cleansing component which includes the following ingredients.

Ingredients	Wt%
Monosodium lauroyl glutamate	22.0
Cocamidopropyl betaine	2.0
Sodium chloride	1.0
Glycerin	2.5
Water	72.5

Heat the components together with gentle stirring until homogeneous.

#### Example 17

Prepare a representative cleansing component that includes the following ingredients.

Ingredients	Wt%
Triethanolamine	2.9
Polyquaternium-39	0.1
Monolauryl phosphate	4.0
CI2-CI4N-methyl Glucose amide <sup>1</sup>	5.0
Cocamidopropylhydroxysultaine <sup>2</sup>	2.0
Sodium decyl sulfate	0.5
Citric acid monohydrate	0.3
Perfume, Preservatives & misc.	4.0
Water	81.2

<sup>1</sup> Available from Hoechst Celanese

<sup>2</sup> Available from Rhone Poulenc

Add ingredients slowly in the following order at 60C until each is dissolved in the water: TEA, lauryl phosphate, glucose amide. Cool to 45C and add sultaine, polyquaternium-39 and sulfate, stirring as before. Add perfume, preservatives and cool to room temperature.

#### Example 18

Prepare a representative cleansing component by mixing the following ingredients.

Ingredients	Wt%
Lauroyl polyglucose <sup>1</sup>	20.0
Cetyltrimethylammonium bromide	4.0
Perfume, Preservatives & misc.	4.0
Water	72.0

<sup>1</sup> Available as Plantaren 1200 from Henkel

#### Example 19

Prepare a representative cleansing component by mixing the following ingredients.

Ingredients	Wt%
Decylpolyglucose	14.8
Cocamidopropyl betaine	14.8
Sodium lauroyl sarcosinate	14.8
Butylene glycol	3.6
PEG 14M	1.8
Polyquaternium-10	0.9
Dex panthenol	0.7
Phenoxyethanol	0.5
Benzyl alcohol	0.5
Methylparaben	0.45
Propylparaben	0.25
Disodium EDTA	0.2
Water	55.1

#### Example 20

Prepare a representative antibacterial cleansing component by mixing the following ingredients.

Ingredients	Wt %
Dimethicone	0.5
Ammonium Lauryl Sulfate	0.6
Glucono-delta-lactone	2.27

Propylene Glycol	0.5
Triclosan	0.15
Sodium Benzoate	0.2
Tetrasodium EDTA	0.1
Silicone polyether	0.4
Fragrance	0.03
SD Alcohol 40	10
Sodium Hydroxide	0.2
Water	QS

**Example 21**

Prepare a representative antibacterial cleansing component by mixing the following ingredients.

Ingredients	Wt %
Dimethicone	0.5
Ammonium Lauryl Sulfate	0.6
Glucono-delta-lactone	2.27
PPG-15 Stearyl Ether	0.5
Triclosan	0.15
Sodium Benzoate	0.2
Dimethicone	0.03
Tetrasodium EDTA	0.1
Sodium Chloride	0.4
SD Alcohol 40	10
Sodium Hydroxide	0.2
Fragrance	0.01
Water	QS

**II. Conditioning Components****Examples 22-26**

Prepare a representative skin conditioning component by mixing the following components.

Ingredients	Example 22	Example 23	Example 24	Example 25	Example 26
SEFA* Cottonate	48.0	75.0	33.5	40.0	80.0
SEFA* Behenate	12.0	25.0	8.4	10.0	10.0
Petrolatum	10.0	-	7.0	-	-
Glyceryl Tribehenate	5.0	-	3.5	-	-
Stearyl Alcohol	-	-	-	5.0	-
Paraffin	-	-	-	15.0	-
Cholesterol Ester	25.0	-	17.5	-	-
Ozokerite Wax	-	-	-	-	10.0
Glycerin	-	-	28.0	-	-
Triglyceryl monostearate	-	-	1.9	-	-
Decaglyceryl dipalmitate	-	-	0.2	-	-
Nonylphenol	-	-	-	30.0	-

polyglycine ether <sup>1</sup>					
-----------------------------------	--	--	--	--	--

<sup>1</sup>SEFA is an acronym for sucrose esters of fatty acids

<sup>1</sup>Hamplex TNP, Hampshire Chemical Co.

### Examples 27-31

Prepare a representative skin conditioning component by mixing the following ingredients.

Ingredients	Example 27	Example 28	Example 29	Example 30	Example 31
Petrolatum (white)	35.87	35.87	-	-	34.0
Mineral oil	11.0	13.0	-	-	10.0
Jobba oil	-	-	-	4.5	
Castor oil	10.0	9.0	-	-	
Cocoa butter					5.0
Diisostearyl trimethylpopane siloxy silicate	20.0	20.0	-	-	
Polydimethylsiloxane, 500 cSt fluid	-	-	0.7	1.5	
Decamethylcyclopentasi loxane	-	-	-	16.5	
Octamethylcyclotetra siloxane	-	-	-	10.0	
Polydimethylsiloxane, gum	-	-	5.9	7.5	
Stearyl methicone wax	-	-	-	3.0	
Polybutene	-	-	-	4.5	
Candelilla wax	4.6	4.6	-	-	6.0
Paraffin wax	-	-	-	15.0	2.0
Microcrystalline wax	-	-	-	6.0	4.0
Beeswax	3.0	3.0	-	-	4.0
Ozokerite wax	6.0	6.0	-	-	
Carnauba wax	3.0	3.0	-	-	
Hydrogenated castor oil	0.50	0.50	4.0	-	
Silica	-	-	-	4.5	
Sodium magnesium silicate	-	-	-	1.5	
Tocopherol	0.03	0.03	-	-	
Cyclomethicone	-	-	59.0	-	
Stearyl alcohol	-	-	25.5	-	9.0
Cetyl alcohol					9.0
Glyceryl stearate	-	-	2.6	-	
Acetylated monoglyceride					15.0
Diisostearyl maleate <sup>1</sup>	-	-	-	6.0	
Glyceryl distearate	-	-	-	9.5	
Glycerin	-	-	-	6.0	
Water	-	-	-	3.0	
Nonylphenol polyglycine ether <sup>2</sup>	-	-	5.0	-	
Micronized titanium dioxide		5.0	-	-	
Octyl methoxycinnamate	5.0	-	-	-	
Fragrance & misc.	1.0	1.0	1.0	1.0	2.0

<sup>1</sup> Available as Myvacet 7-07, about half acetylated, from Eastman Chemical Co.

<sup>2</sup> Available as Hamplex TNP, Hampshire Chemical Co.

### Example 32

Prepare a representative skin conditioning component by mixing the following ingredients.

Ingredients	Example 32
Polydecene <sup>1</sup>	53.3
Stearyl Alcohol	7.7
12-Hydroxystearic acid	13.5
Nonylphenol polyglycine ether	25.0
Octyl methoxycinnamate	1.5

<sup>1</sup>Puresyn 3000, Mobil Chemical Co.

### Examples 33-35

Prepare a representative skin conditioning component by mixing the following ingredients.

Ingredients	Example 33	Example 34	Example 35
Glycerin	95.0	95.0	94.0
Decaglyceryl dipalmitate <sup>1</sup>	5.0	1.0	5.0
Deceglyceryl dibehenate		4.0	
Tribehenin			1.0

<sup>1</sup> Available as Polyaldo 10-2-P from Lonza

### Examples 36-40

Prepare a representative conditioning component for the articles of the present invention in the following manner.

Ingredients	Example 36	Example 37	Example 38	Example 39	Example 40
Hydrophobic Phase:					
SEFA* cottonate	4.65	4.65	15.5	15.5	
SEFA* behenate	0.35	0.35	8.0	8.0	
Tribehenin			6.0	6.0	
Petrolatum			4.0	4.0	4.4
Cocoa butter					15.5
C10-C30 Cholesterol/Lanosterol esters			13.0	13.0	
Polyglyceryl-4 isostearate (and) Cetyl dimethicone (and) Hexyl laurate <sup>2</sup>	5.0	5.0			
PEG 30 dipolyhydroxystearate <sup>3</sup>			3.0		
Tetraglyceryl monostearate				2.1	
Decaglyceryl dipalmitate				0.90	
Ceresin wax					5.5
Beeswax					7.0
Lecithin, purified					10.0

I-Monostearin					10.0
Hydrophilic Phase:					
Glycerin	70.0	66.5	42.30	42.30	40.0
Water		3.5			5.0
PVM/MA decadiene crosspolymer <sup>4</sup>			0.25	0.25	
Sodium hydroxide (10% solution)			0.25	0.25	
Gelatin					2.6
Active skin care ingredients:					
Panthenol	20.0	10.0	2.50		
Nicotinamide		5.0	2.50	3.0	
Urea		5.0	2.50	2.50	
Allantoin			0.20	0.20	
Acetamidopropyl trimonium chloride				2.0	

\* SEFA is an acronym for sucrose esters of fatty acids

<sup>1</sup> Available as AMS-C30 from Dow Corning

<sup>2</sup> Available as Abil WE-09 from Goldschmidt

<sup>3</sup> Available as Arlacel P135 from ICI

<sup>4</sup> Available as Stabileze 06 from ISP

Process for all emulsions:

Heat the hydrophobic phase to 70°C, add the hydrophobic active skin care ingredients, and stir until homogenous. Premix the hydrophilic phase ingredients with the hydrophilic active skin care ingredients, heating gently if necessary to dissolve or disperse them. Add these slowly to the hydrophobic phase, continuing to stir. Homogenize (high shear mixer; ultrasonic homogenizer; or high pressure homogenizer such as Microfluidizer from Microfluidics Corp.). Apply immediately to substrate surface or cool rapidly to below room temperature in ice or ice water. Store in controlled environment, under nitrogen if needed for chemical stability.

#### Examples 41-45

Prepare a representative conditioning component as described in Examples 36-40 using the following ingredients.

Ingredients	Example 41	Example 42	Example 43	Example 44	Example 45
Hydrophobic Phase:					
SEFA* cottonate			15.0	16.0	
SEFA* behenate			7.5	4.0	
Tribehenin			6.0		
Petrolatum			4.0	4.0	4.4
Cocoa butter					15.5
Polydecene <sup>1</sup>	50.0	46.5			
CI0-C30			13.0	10.5	
Cholesterol/ Lanosterol esters					
PEG 30 dipolyhydroxy- stearate			3.0	3.0	
Ceresin wax					5.5
Beeswax					7.0

Aluminum/ magnesium hydroxystearate in mineral oil <sup>2</sup>				7.5	
C30-38 Olefin/isopropyl maleate copolymer <sup>3</sup>				2.5	
Polyethylene wax <sup>4</sup>				1.0	
Lecithin, purified					10.0
Fragrance and misc.			1.0		
1-Monostearin					10.0
Hydrophilic Phase:					
Glycerin	30.0	25.0	34.80	20.0	38.0
Water	8.0	8.0			5.0
PEG 2000				17.0	
PVM/MA decadiene crosspolymer			0.25		
Sodium hydroxide (10% solution)			0.25		
Gelatin	9.50	9.50			2.6
Active skin care ingredients:					
Nicotinamide			2.50		
Menthol in 50% beta cyclodextrin		2.50			
Ascorbic acid (natural)		2.50			
Tocopherol (natural)		1.00		2.50	
Sorbitol			2.50		
Lactic acid	2.5				
Urea			2.50		
Allantoin			0.20		
Triclosan					1.50
Chlorhexidine					0.50
Benzoyl peroxide			5.0		
15% Salicylic acid in PPG 14 butyl ether				12.0	
Salicylic acid			2.5		

<sup>1</sup> Available as Puresyn 3000 from Mobil

<sup>2</sup> Available as Gilugel Min from Giulini Chemie

<sup>3</sup> Available as Performa 1608 from New Phase Technologies

<sup>4</sup> Available as Performalene 400 from New Phase Technologies

#### Examples 46-50

Prepare a representative conditioning component as described in Examples 36-40 using the following ingredients.

Ingredients	Example 46	Example 47	Example 48	Example 49	Example 50
Hydrophobic Phase:					
SEFA* cottonate	20.5	15.5			16.0
Mineral oil			7.50		
SEFA* behenate	8.0	8.0			8.0
Tribehenin	9.5	6.0			6.0
Petrolatum (white or superwhite)	4.0	4.0	22.6	3.0	4.0
Candelilla wax			4.50		
Paraffin wax			3.00	14.0	
Microcrystalline wax			1.50		
Beeswax			3.00		
CI0-C30 Cholesterol/Lanos terol esters	18.0	13.0			13.0
Laurylmethicone copolyol <sup>1</sup>				5.0	
Acetylated monoglyceride <sup>2</sup>			11.3		
Stearyl alcohol			6.8		
Cetyl alcohol			6.8		
PEG 30 dipolyhydroxy- stearate	4.5	3.0			
Decaglyceryl dipalmitate <sup>3</sup>					0.90
Tetraglyceryl monostearate					2.10
Fragrance, misc.	1.0		3.0	2.0	
Hydrophilic Phase:					
Glycerin	22.8	27.5	25.0	38.0	41.0
Decaglyceryl dipalmitate <sup>3</sup>	2.5				
Calcium silicate microspheres <sup>4</sup>		15.0			
Active skin care ingredients:					
Guar hydroxypropyl- trimonium chloride	1.00				
Chitosan glycolate		2.50			
Nicotinamide	1.50	2.50	2.50		
0.2% Carbopol 940 aqueous solution, pH 6.0				38.0	
Retinol					2.50
Phytantriol <sup>5</sup>	1.00				
Urea	2.50	3.0	2.50		
Vitamin C					2.50
Borage oil					2.50
Ascorbyl palmitate					1.50

Acetamidopropyl trimonium chloride <sup>6</sup>	2.50				
---	------	--	--	--	--

<sup>1</sup> Available as Dow Q2-5200, Dow Corning

<sup>2</sup> Available as Myvacet 7-07, about half acetylated, from Eastman Chemical Co.

<sup>3</sup> Available as Polyaldo 10-2-P from Lonza

<sup>4</sup> Available as Celite C from Celite Co.

<sup>5</sup> Available as Hydagen CMF from Henkel

<sup>6</sup> Available as Incromectant AQ from Croda

Example 47: Glycerin incorporated into microspheres, then blended into molten lipid phase and cooled for storage or applied to substrate.

#### Examples 51-56

Prepare a representative conditioning component as described in Examples 36-40 using the following ingredients.

Ingredients	Example 51	Example 52	Example 53	Example 54	Example 55	Example 56
Hydrophobic Phase:						
SEFA* cottonate	16.0	16.0	16.0	16.0	16.0	16.0
SEFA* behenate		8.0	8.0	8.0	8.0	8.0
Tribehenin	6.0	6.0	6.0	6.0	6.0	6.0
Petrolatum (white or supervhite)	4.0	4.0	4.0	4.0	4.0	4.0
CI0-C30 Cholesterol/ Lanosterol esters	13.0	13.0	13.0	13.0	13.0	13.0
Stearyl dimethicone	2.0					
Dimethicone hydroxystearate	4.0					
Dimethicone copolyol behenate	2.0					
PEG 30 dipolyhydroxy stearate			3.00		3.00	
Sodium lauroyl glutamate				2.00		
Sodium stearyl lactylate				2.00		
Calcium stearate						5.0
Decaglyceryl dipalmitate	0.90	0.90		0.90		0.90
Tetraglyceryl monostearate	2.10	2.10		2.10		2.10
Fragrance,	1.00	1.00	1.00	1.00	1.00	1.00

misc.						
Hydrophilic Phase:						
Glycerin	44.5	42.5	35.5	35.5	25.0	43.0
75% Polyethylene-imine <sup>1</sup> in water, pH 6.5			4.50	4.50		
Water						2.0
Decaglyceryl dipalmitate			2.50	2.50		
Fumed silica					20.0	
Propylene glycol alginate <sup>2</sup>						2.0
Active skin care ingredients:						
Nicotinamide		2.00			2.00	
Chitosan		1.50				
Green tea extract	4.50					
Aloe vera gel		3.0				
Vitamin C			2.50			
Ascorbyl palmitate			2.00	2.50		
Acetamidopropyl trimonium chloride			2.00		2.00	

<sup>1</sup> Available as Epomin SP-018 from Nippon Shokubai Co.

<sup>2</sup> Available as Kelcoloid HVF from Kelco

#### Examples 57-59

Prepare a representative conditioning component for the articles of the present invention in the following manner.

Ingredients	Example 57	Example 58	Example 59
Hydrophobic Phase:			
Lecithin, purified <sup>1</sup>	15.4	10.3	10.8
Decane	28.6	19.2	15.0
Mineral Oil			5.0
Tricontanyl PVP <sup>2</sup>			26.0
Stearyl alcohol		13.0	
12-hydroxystearic acid		19.4	
Hydrophilic Phase:			
Glycerin	28.0	18.8	19.6
Propylene glycol	28.0	18.8	19.6
Active skin care ingredients:			
Triclosan		0.20	
Salicylic acid		0.40	
Nicotinamide			4.0

<sup>1</sup> Available as Epikuron 200 from Lucas Meyer

<sup>2</sup> Available as Ganex WP-660 from ISP

Stir all ingredients together until microemulsion forms. Add skin care ingredients first to the phase which most closely matches their solubility parameter. When adding waxes, heat

slowly just to the wax melting point, disperse by stirring, and add to substrate or cool to room temperature and store.

#### Examples 60-62

Prepare a representative conditioning component for the articles of the present invention in the following manner.

Ingredients	Example 60	Example 61	Example 62
Hydrophobic Phase:			
Isohexadecane	42.29	43.0	28.3
Sodium dioctyl sulfosuccinate <sup>2</sup>	10.62	7.0	7.1
Hydrophilic Phase:			
Glycerin	35.17	19.0	23.6
Water	11.72	19.0	7.8
Carnauba wax			29.0
Gelatin		6.0	
Active skin care ingredients:			
Triclosan	0.20		
Titanium dioxide, cosmetic			4.2
Titanium dioxide, micronized		4.2	
Salicylic acid		1.8	

<sup>1</sup> Available as Epikuron 200 from Lucas Meyer

<sup>2</sup> Available as Aerosol OT from Pfaltz and Bauer

Add skin care ingredients first to the phase which most closely matches their solubility parameter. Then, stir all ingredients together until microemulsion forms. Coat onto substrate surface.

#### Examples 63-68

Prepare a representative conditioning component for the articles of the present invention in the following manner.

Ingredients	Example 63	Example 64	Example 65	Example 66	Example 67	Example 68
Part A						
Sodium lauroyl ether sulfate (SLES, add as 27% active)	15.0	6.51	6.20			5.9
Cocamido-propyl betaine <sup>1</sup>	13.5	5.85	5.57	5.82	5.19	5.3
Sodium lauroyl sarcosinate <sup>2</sup>	1.35	0.60	0.57	6.01	5.36	0.54
Decylpoly-glucose <sup>3</sup>				5.80	5.18	
Lauryl alcohol	1.31	0.56	0.54			0.54
Polyethylene-imine <sup>4</sup>	7.87	3.38	3.22	2.64	2.36	3.2
Citric acid	0.32	0.11	0.11			0.09

(add as 50% aqueous solution)						
Tetrasodium EDTA	0.28					
Sulfuric acid	5.4	2.37	2.25			2.2
Preservative, fragrance	0.62	0.45	0.43	2.86	2.55	0.3
Sodium sulfate	7.9	3.47	3.21			3.0
Glycerin	26.45	56.7	46.4	44.1	39.36	44.8
Sorbitol			5.0			
SEFA* cottonate					12.8	
SEFA* behenate					8.0	

## Part B – Polymer gelling agents

Gelatin					4.2	
Polyacrylamide and isoparaffin <sup>5</sup>				7.5		
Polyurethane latex in 50% isopropanol <sup>6</sup>						34.1
Polyacrylate copolymer <sup>7</sup>				7.5		
Polystyrene sulfonates copolymer <sup>8</sup>			1.1			
Chitosan lactate			5.4			

## Part C – Physical gelling agents

12-Hydroxystearic acid	10.0			10.66		
Stearyl alcohol	10.0	20.0	20.0	7.11	15.0	

\* SEFA is an acronym for sucrose esters of fatty acids

<sup>1</sup> Available as Tegobetaine F from Goldschmidt

<sup>2</sup> Available as Hamposyl L-30 (type 721) from Hampshire Chemical, 31% active

<sup>3</sup> Available as Plantaren 2000NP from Henkel

<sup>4</sup> Available as Epomin SP-018, molecular weight about 1800, from Nippon Shokubai Co.

<sup>5</sup> Available as Carbopol Ultrez from B.F. Goodrich

<sup>6</sup> Available as Sancure 2710 from B.F. Goodrich, prepared as premix comprising about 20% polymer, 30% water, 50% IPA

<sup>6</sup> Available as Sepigel 305 from Seppic Corp.

<sup>7</sup> Available as AQ38S from Eastman Chemical

Blend the surfactants and fatty alcohol while heating to 65°C with a low speed impeller mixer. Remove from heat, allow to cool to 65°C while continuing to mix. Add the cationic polymer and stir until homogeneous. Slowly add remaining Part A ingredients while stirring. Homogenize to disperse the SEFA as an emulsion. Titrate with concentrated sulfuric acid until

a pH of about 6.5 is reached. Prepare a dried mixture by spreading the Part A composition in trays and drying in a suitable (vacuum or convection) oven at a temperature not exceeding 65°C until essentially no water remains. Blend the dried Part A ingredients with the polymeric gelling agents from Part B, heat to dissolve or disperse. Blend the resulting composition with the physical gelling agents. Heat to melt and dissolve gelling agents into the composition. Apply to substrate surface(s) or cool to room temperature and store.

#### Examples 69-74

Prepare a representative conditioning component for the articles of the present invention as described in Examples 63-68 using the following ingredients.

Ingredients	Example 69	Example 70	Example 71	Example 72	Example 73	Example 74
Part A						
Sodium lauroyl sarcosinate <sup>1</sup>	8.87			11.4	10.8	10.8
Polyethyleneimine <sup>2</sup>	7.39	7.50	7.50	9.5	9.0	9.0
Water	4.43	3.00	3.00	5.7	5.4	5.4
Sulfuric acid	6.36	QS	QS	8.1	7.7	7.7
Fragrance, misc.						
Glycerin	34.45	52.5	45.0	41.3	39.25	34.25
Propylene glycol	2.50					
Urea		2.50	2.50	2.0	1.9	1.9
Panthenol				2.0	1.9	1.9
Nicotinamide		2.50	2.50	2.0	1.9	1.9
Salicylic acid						
Polymethylsilsequioxane <sup>3</sup>					4.20	4.20
Mica, pearlescent					3.85	3.85
Stearyl methicone wax						5.0
SEFA cottonate			5.0			
Petrolatum			5.0			
Part B – Polymer gelling agents						
Gelatin						0.1
Polyacrylamide and isoparaffin <sup>4</sup>	16.0	12.0	12.0			
Part C – Physical gelling agents						
12-Hydroxystearic acid	12.0	12.0	10.5			
Carnauba wax				18.0	14.1	14.1
Stearyl alcohol	8.0	8.0	7.0			

<sup>1</sup> Available as Hamposyl L-95 from Hampshire Chemical, dry

<sup>2</sup> Available as Epomin SP-018, molecular weight about 1800, from Nippon Shokubai Co.

<sup>3</sup> Available as Tospearl 145A from Kobo, Inc.

<sup>4</sup> Available as Sepigel 305 from Seppic Corp.

### Examples 75-78

Prepare a representative skin conditioning component which includes the following components.

	Example 75	Example 76	Example 77	Example 78
Ingredients	Wt %			
SEFA* Cottonate		62.0	52.0	
Petrolatum			4.5	
Stearyl Alcohol	4.0			
Stearic Acid	3.0			
Lanolin		20.0	13.0	
Ethylene vinyl acetate polymer <sup>1</sup>		10.0	10.0	
Polydecene <sup>2</sup>			2.0	2.0
Sodium lauroyl sarcosinate <sup>3</sup>	25.0	3.00	3.0	
Lauryl betaine <sup>4</sup>		1.50	2.0	
Lauroamphoacetate <sup>5</sup>				5.25
Sodium laureth-3 sulfate <sup>6</sup>				10.5
Cocamide MEA <sup>7</sup>				2.80
Sulfuric acid	QS			
Guar hydroxypropyltrimonium chloride	0.50		0.50	
Cholesterol <sup>8</sup>	9.0	1.0		
Nonylphenol polyglycine ether <sup>9</sup>			5.0	
Micronized titanium dioxide			4.0	
Octyl methoxycinnamate			4.0	
Nicotinamide		2.5		
Glycerin	10.0			3.00
Water	48.5			55.95
PEG 6 caprylic/capric glycerides				3.40
Maleated soybean oil				1.50
Soybean oil (deodorized)				8.0
Palm kernel fatty acids				2.60
Polyquaternium-10				0.40
Fragrance, preservative, misc.				4.60

\*SEFA is an acronym for sucrose esters of fatty acids

<sup>1</sup> Available Elvax 40W from DuPont

<sup>2</sup> Available as Puresyn 3000 from Mobil

<sup>3</sup> Available as Hamposyl L95 (solid) or L30 (30% active in water) from Hampshire Chemical, e.g.

<sup>4</sup> Available as Empigen BS98 from Albright & Wilson (80% betaine, 20% salt)

<sup>5</sup> Available Empigen CDL60 from Albright & Wilson

<sup>6</sup> Available as Empicol ESC3 from Albright & Wilson

<sup>7</sup> Available as Empilan CME/G from Albright & Wilson

<sup>8</sup> Available as Super Hartolan from Croda

<sup>9</sup> Hamplex TNP, Hampshire Chemical Co.

Melt the lipid components, add the water (if applicable) and humectant(s), add the surfactant and continue to heat and stir until homogeneous. Cool to room temperature and add the skin care active(s) and deposition agent(s). Adjust pH to about 7.0 with sulfuric acid. Spray, roll, dip or otherwise apply to substrate and dry (if water containing) before packaging.

#### Examples 79-82

Prepare representative skin conditioning components that include the following components.

Example	79	80	81	82
Ingredient	Wt %			
Niacinamide	2.0	4.0	6.0	2.0
Retinyl Propionate	-	0.2	-	-
Panthenol	1.0	2.0	0.5	0.5
Polyacrylamide & isoparaffin & laureth-7	2.0	2.25	2.25	2.0
Glycerine	5.0	3.0	7.0	12.0
Allantoin	0.2	0.05	0.1	-
Aloe vera gel	0.05	0.075	0.05	-
Tocopheryl acetate	0.75	0.5	0.5	0.5
Cetyl alcohol	2.0	1.0	1.25	0.3
Stearyl alcohol	2.0	1.0	1.25	0.5
Behenyl alcohol	1.0	1.0	1.25	0.4
Dimethicone & dimethiconol	0.75	0.5	0.50	2.0
Steareth-21	0.6	0.4	0.5	-
Steareth-2	0.1	0.08	0.03	-
Cetearyl glucoside	-	-	-	0.5
PPG-15 stearyl ether	3.0	2.0	1.00	1.00
Isohexadecane	-	7.0	5.0	5.4
Isononyl isononanoate	5.0	-	-	-
SEFA Cottonate	-	-	-	1.2
Dimethicone (350 mm <sup>2</sup> s <sup>-1</sup> )	0.5	0.0	0.60	-0.60
Disodium EDTA	0.10	0.10	0.10	0.10
Nylon 12 <sup>1</sup>	1.5	1.0	1.1	2.0
Titanium Dioxide (and) Mica <sup>2</sup>	0.75	1.5	1.25	0.25
Polydecene <sup>3</sup>	0	0	0	0
Petrolatum	1.00	4.00	2.00	2.00

Deionised water, fragrance, preservatives	to 100%	to 100%	to 100%	to 100%
--	---------	---------	---------	---------

Examples 83-86

Prepare representative skin conditioning components that include the following components.

Example	83	84	85	86
Ingredient	Wt %			
Niacinamide	2.0	3.0	5.0	3.5
Retinyl Propionate	0.28	0.10	0.28	0.28
Panthenol	1.0	1.5	0.5	0.5
Polyacrylamide & isoparaffin & laureth-7	2.0	2.25	2.25	2.0
Glycerine	6.0	4.0	7.0	10.0
Allantoin	0.10	0.10	0.10	-
Aloe vera	0	0.03	0.07	-
Tocopheryl Acetate	0.50	1.25	0.50	0.50
Cetyl Alcohol	0.75	1.0	1.25	0.5
Stearyl alcohol	1.0	1.5	1.20	0.3
Behenyl alcohol	1.00	1.50	1.25	0.4
Steareth-2	0.05	0.05	0.05	-
Steareth-21	0.40	0.45	0.50	-
Cetearyl glucoside	-	-	-	0.5
PPG-15 stearyl ether	3.0	2.0	1.00	1.00
Isohexadecane	5.0	7.0	-	5.4
Isopropyl isostearate	-	-	5.0	2.4
Isononyl isononanoate	1.0	-	-	-
SEFA Cottonate	-	-	-	1.2
Disodium EDTA	0.10	0.10	0.10	0.10
Nylon 12 <sup>1</sup>	1.5	1.0	1.1	2.0
Titanium Dioxide (and) Mica <sup>2</sup>	0.75	1.5	1.25	-
Polydecene <sup>3</sup>	1.00	2.00	1.10	-
Petrolatum	-	-	-	2.0
Deionised water, fragrance, preservatives	to 100%	to 100%	to 100%	to 100%

Examples 87-88

Prepare representative skin conditioning components that include the following components.

Example	87	88
Ingredient	Wt %	
Niacinamide	2.0	3.5
Panthenol	1.0	2.0
Polyacrylamide & isoparaffin & laureth-7	2.25	2.75
Glycerine	10.0	9.0
Tocopheryl Acetate	0.50	0.75
Cetyl Alcohol	0.8	1.5
Stearyl alcohol	0.6	1.0

PEG-100 stearate	0.1	0.1
Stearic acid	0.1	0.1
Sucrose cocoate and sorbitan stearate <sup>4</sup>	1.0	1.0
Dimethicone and dimethiconol	2.0	4.0
Isohexadecane	3.0	2.0
Isopropyl isostearate	1.5	1.0
SEFA Cottonate	0.5	1.0
Disodium EDTA	0.10	0.10
Polymethylsilsesquioxane <sup>5</sup>	0.5	1.0
Titanium Dioxide	0.2	0.6
Polydecene <sup>3</sup>	1.0	-0
Petrolatum	-	3.0
Deionised water, fragrance, preservatives	to 100%	to 100%

<sup>1</sup> Orgasol® 2002 D NAT COS.

<sup>2</sup> A green interference pigment

<sup>3</sup> Silkflo 364 NF from BP Amoco

<sup>4</sup> Arlatone 2121 from ICI

<sup>5</sup> Tospearl 145a from GE Silicones

#### Example 89

Prepare a representative skin conditioning component that is particularly suitable for use by infants, toddlers, and children by mixing the following ingredients.

Ingredient	Wt %
Water	74.810
Disodium EDTA	0.100
SEPIGEL 305	1.200
Glycerin	7.000
Montanov 68	0.500
Isohexadecane	5.400
Ethyl paraben	0.150
Propyl paraben	0.070
Stearic Acid	0.100
PEG-100- Stearate	0.100
Stearyl Alcohol	0.480
Cetyl Alcohol 95%	0.320
Behenyl Alcohol	0.400
Isopropyl Isostearate	2.400
SEFA Cottonate	1.200
Nylon 12	1.000
Tospearl 145A	0.250
Sodium Hydroxide - 40 % solution	0.020
Benzyl Alcohol	0.250
Petrolatum	2.000

DCT403	2.000
Fragrance	0.250

### III. CLEANING COMPONENTS

#### Examples 90-91

Prepare representative cleaning components suitable for use as a daily shower cleaner by combining the following ingredients.

Ingredients	Example 90	Example 91
	Wt %	
Sodium C <sub>12-14</sub> alkyl sulfate	0.20%	-
Alkylpolyglucoside	-	0.25%
poly(4-vinylpyridine N-oxide) polymer	0.075%	0.075%
Sodium carbonate	0.015%	-
Water	Balance	Balance
Perfume	-	-

#### Examples 92-105

Prepare representative floor cleaning components by mixing the following ingredients.

	C <sub>8-16</sub> APG Plantaren 2000	C <sub>10-16</sub> APG Plantaren 1200	C <sub>8-12</sub> APG Akzo AG6210	C <sub>11</sub> EO5 Neodol	PVNO Reilly	Propoxy Propanol
	Wt %					
Example 92	0.06	-	-	-	-	-
Example 93	0.06	-	-	-	0.015	-
Example 94	0.06	-	-	-	0.015	2.0
Example 95	-	0.06	-	-	-	-
Example 96	-	0.06	-	-	0.015	-
Example 97	-	0.06	-	-	0.015	2.0
Example 98	-	-	0.06	-	-	-
Example 99	-	-	0.06	-	0.015	-
Example 100	-	-	0.06	-	0.015	2.0
Example 101	-	-	-	0.06	-	-
Example 102	-	-	-	0.06	0.015	-
Example 103	-	-	-	0.06	0.015	2.0
Example 104	-	-	-	-	0.015	-
Example 105	-	-	-	-	0.015	2.0

Note: All formulations in Examples 92-105 contain Dow Corning AF suds suppressor at 0.015% and Perfume at 0.04% and deionized water balance

Compositions: All raw materials are purchased from commercial sources. The PVNO used in examples above is made by Reilly industries, and has a molecular weight of ~20,000 g/mole.

The surfactants used are Plantaren 2000 from Henkel a commercially available, cosmetic grade, C<sub>8-16</sub> alkylpolyglucoside, Plantaren 1200 from Henkel is a commercially available cosmetic grade C<sub>10-16</sub> alkylpolyglucoside. AG-6210 from Akzo, a commercially available C<sub>8-12</sub> alkylpolyglucoside, Neodol C11 EO5 is a commercially available non-ionic alkylethoxylate containing an alkyl group with an average chain length of about 11 carbon atoms and about five ethoxy groups per molecule on the average. The solvent used is Propylene Glycol Propyl Ether from Sigma Aldrich.

#### Examples 106-111

Prepare representative antibacterial hard surface cleaning components by mixing the following ingredients.

	Example 106	Example 107	Example 108	Example 109	Example 110	Example 111
Ingredient	Wt %					
Organic Acid #1 <sup>1</sup>	1.5	1.5	2.75	1.25	1.5	0.75
Surfactant #1 <sup>2</sup>	1.75	1.75	1.0	1.0	1.0	2.0
Solvent #1 <sup>3</sup>	0.5	0.5	---	---	0.5	0.5
Hydrotrope <sup>4</sup>	1.2	1.2	---	0.45	1.20	1.2
Suds Suppressor <sup>5</sup>	---	0.0037	---	0.0030	---	---
Perfume	0.2	0.2	---	0.20	0.20	0.2
Water	Balance	Balance	Balance	Balance	Balance	Balance

<sup>1</sup> Citric acid commercially available from Cargill.

<sup>2</sup> Nonionic alcohol ethoxylate surfactant commercially available from Vista Chemical Company under the tradename ALFONIC® 810-6 Ethoxylated.

<sup>3</sup> Butoxy propoxy propanol commercially available from Dow Chemical.

<sup>4</sup> Sodium cumene sulfonate commercially available from Reutgers-Nease Chemical Company under the tradename NAXONATE® 45SC.

<sup>5</sup> Silicone suds suppressor commercially available from Dow Corning under the tradename DOW AF.

#### Examples 112-115

Prepare representative antibacterial hard surface cleaning components by mixing the following ingredients.

	Example 112	Example 113	Example 114	Example 115
Ingredient	Wt %			
Organic Acid #1 <sup>6</sup>	1.5	1.5	---	---
Organic Acid #2 <sup>7</sup>	---	---	4.0	---
Organic Acid #3 <sup>8</sup>	---	---	---	3.0
Surfactant #1 <sup>9</sup>	---	---	1.0	1.5
Surfactant #2 <sup>10</sup>	0.4	1.0	---	---
Solvent #2 <sup>11</sup>	9.4	9.4	---	---
Solvent #3 <sup>12</sup>	0.55	0.55	---	---
Solvent #4 <sup>13</sup>	0.55	0.55	---	---
Perfume	0.075	0.75	---	---
Water	Balance	Balance	Balance	Balance

<sup>6</sup> Citric acid commercially available from Cargill.

<sup>7</sup> Acetic acid commercially available from Aldrich.

<sup>8</sup> Lactic acid commercially available from Aldrich.

<sup>9</sup> Nonionic alcohol ethoxylate surfactant commercially available from Vista Chemical Company under the tradename ALFONIC® 810-6 Ethoxylated.

<sup>10</sup> Amine oxide (C<sub>12</sub>) surfactant commercially available from the Stepan Company under the trade name NINOX® X9336.

<sup>11</sup> Ethanol commercially available from Aldrich.

<sup>12</sup> Propylene glycol t-butyl ether commercially available from Aldrich.

<sup>13</sup> Di(ethylene glycol) butyl ether commercially available from Aldrich.

#### Examples A-E

Prepare a cleaning component suitable for cleaning and refreshing fabric via a containment bag. Mix the following ingredients.

#### Example A

Ingredient	Wt%
Emulsifier (TWEEN 20)*	0.5
Perfume	0.5
KATHON®	0.0003
Sodium Benzoate	0.1
Water	Balance

\*Polyoxyethylene(20) sorbitan monolaurate available from ICI Surfactants

Additionally, preferred cleaning components for use in the dryer are:

Ingredient	Wt%	Range (Wt%)
Water	99.0	95.1-99.9
Perfume	0.5	0.05-1.5
Surfactant	0.5	0.05-2.0
Ethanol or Isopropanol	0	Optional to 4%
Solvent	0	Optional to 4%

Additionally, preferred cleaning components for use in the dryer are:

	Example B	Example C	Example D	Example E
Ingredient	Wt %			
Water	97.63	98.85	77.22	96.71
Perfume	0	0.38	0.38	0
Surfactant	0.285	0	0	0.285
Solvent (e.g., BPP)	2.0	0	0	2.0
KATHON®	0.0003	0	0	0
Emulsifier	0	0.5	0.38	0

(TWEEN 20)*				
Amine Oxide	0.0350	0	0	0.0350
MgCl <sub>2</sub>	0.045	0	0	0
MgSO <sub>4</sub>	0	0	0.058	0
Hydrogen Peroxide	0	0	0	0.6
Citric Acid	0	0	0	0.5
Proxel GXL	0	0.8	0.8	0
Bardac 2250	0	0.2	0.2	0
1,2-Propanediol	0	0	21.75	0

\*Polyoxyethylene(20) sorbitan monolaurate available from ICI Surfactants

#### IV. COSMETIC COMPONENTS

##### Example 116

Prepare a cosmetic component suitable for providing protection against UV radiation to skin.

Example 116	
Ingredient	Wt %
Hydrophilic Phase:	
Water	69.9
D-panthenol	0.8
Disodium EDTA	0.1
Polyacrylamide & C <sub>13-14</sub> Isoparaffin & Laureth-7	1.0
Hydrophobic Phase:	
Octylmethoxycinnamate	7.5
Isohexadecane	2.0
Dimethicone Copolyol	0.7
Steareth-21	1.25
Steareth-2	0.14
Stearyl Alcohol	0.3
Cetylphosphate	0.14
Behenyl Alcohol 65	0.4
PVP Eicosane	2.0
Tocopherol Acetate	0.5
Spectroveil MOTG (Zinc oxide)	8.4
Preservative Phase:	
Glycerin	3.0
Preservative	2.0
Dimethicone Copolyol	3.0
Water	1.0
Pentadecalactone	0.4

#### V. Laminate Webs

The following examples are shown in Table 1 as exemplary laminate webs suitable for the articles of the present invention. Because the choice of outer and inner layers and combinations

is virtually infinite, the examples shown are meant to be illustrative of possible structures of the laminate web, and are not meant to be limiting to any particular material or structure.

In Table 1 various combinations of materials are shown. The layers are numbered in order of structural proximity from one outer layer to the other of the laminate web. Therefore, layer 1 is always an outer layer, and the last numbered layer is likewise an outer layer.

Clopay formed films were obtained from Clopay, Cincinnati, OH. By "formed film" is meant a macroscopically-expanded three-dimensional plastic web comprising a continuum of capillary networks originating in and extending from one surface of the web and terminating in the form of apertures in the opposite surface thereof. Such a formed film is disclosed in commonly assigned U.S. Pat. No. 4,342,314 issued to Radel et al. on Aug. 3, 1982.

Elastomeric formed films are obtained from Tredegar Film Products, Terre Haute, IN. Such films are an improvement in the aforementioned Radel et al. web as disclosed in the above-mentioned commonly assigned, copending US patent application S.N. 08/816,106 entitled Tear Resistant Porous Extensible Web, filed March 14, 1997 in the name of Curro et al. Curro '106 discloses elasticized polymeric webs generally in accordance with the aforementioned Radel et al. patent that may be produced from elastomeric materials known in the art, and may be laminates of polymeric materials. Laminates of this type can be prepared by coextrusion of elastomeric materials and less elastic skin layers and may be used in the body hugging portions of absorbent garments, such as the waistband portions and leg cuffs.

High internal phase emulsion open cell foam materials can be made generally in accordance with the teachings of the above mentioned U.S. Patents 5,260,345 and U.S. Patent 5,268,224.

BBA and Corovin/BBA nonwovens were obtained from BBA, Greenville, SC.

BOUNTY® paper towels were obtained from The Procter & Gamble Co., Cincinnati, OH.

For the materials shown below, the basis weight is expressed in grams per square meter (gsm). Low density polyethylene is denoted "LDPE"; polypropylene is denoted as "PP"; and polyethylene is denoted as "PE". Spunbond is denoted as "SB".

Table 1: Examples of Laminate Webs Suitable for Use in the Articles of the Present Invention

Example No.	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5
117	30 gsm LDPE SB nonwoven from Corovin/B BA	42 gsm BOUNTY ® Paper Towel	30 gsm LDPE SB nonwoven from Corovin/B BA		
118	30 gsm LDPE SB nonwoven from Corovin/B BA	42 gsm BOUNTY ® Paper Towel	42 gsm BOUNTY ® Paper Towel	30 gsm LDPE SB nonwoven from Corovin/B BA	

119	80/20 (PE / PP) 30 gsm SB nonwoven from BBA	42 gsm BOUNTY® Paper Towel	80/20 (PE / PP) 30 gsm SB nonwoven from BBA		
120	80/20 (PE / PP) 30 gsm SB nonwoven from BBA	42 gsm BOUNTY® Paper Towel	23 gsm PE formed film from Clopay	50/50 (PE / PP) 30 gsm SB nonwoven from BBA	
121	30 gsm LDPE SB nonwoven from Corovin/B BA	88 gsm elastomeric formed film from Tredegar	42 gsm BOUNTY® Paper Towel	30 gsm LDPE SB nonwoven from Corovin/B BA	
122	30 gsm LDPE SB nonwoven from Corovin/B BA	Spray hot melt adhesive from Ato-Findley approx. 12 gsm	62 gsm High Internal Phase Emulsion open cell foam	Spray hot melt adhesive from Ato-Findley approx. 12 gsm	30 gsm LDPE SB nonwoven from Corovin/B BA
123	27 gsm high elongation carded PP nonwoven from BBA	42 gsm BOUNTY® Paper Towel	60 gsm laminate of 80/20 50/50 (PE / PP) nonwoven from BBA		
124	50/50 (PE / PP) 30 gsm SB nonwoven from BBA	70 gsm Spun Laced Rayon/PET nonwoven from PGI treated with 52 gsm of Cleansing component <b>Example 19</b> and then dried	50/50 (PE / PP) 30 gsm SB nonwoven from BBA		

#### V. Articles of the Present Invention

##### Example 125

Prepare a representative skin cleansing and conditioning article utilizing the skin conditioning component from any one of **Examples 22-26** and Laminate Web **Example 124**.

The skin conditioning component is slot coated from a hot reservoir pumped through a slot dye onto both sides of the substrate web at a rate equal to 1.25g of component per finished article and passed across a cooling fan so the component cools quickly on the article outer surfaces. The web is cut into individual articles measuring about 120mm x 160 mm rectangles with rounded corners.

Example 126

Prepare a representative skin cleansing and conditioning article in the following manner.

The cleansing component of **Example 11** is applied to one side of Laminate Web **Example 117** by extruding it through a coating head continuously in a single line along the center of the web. The cleansing component is extruded at a rate to yield 0.5 grams per finished article. The skin conditioning component of **Example 23** is slot coated in two stripes 30mm wide on either side of the cleansing component at a distance of 20 mm from the cleansing component. The skin conditioning component is held in a hot reservoir and pumped through a slot dye onto one side of the laminate web at a rate equal to 1.25g of skin conditioning component per finished article. The web is passed across a cooling fan so the conditioning component cools quickly on the article outer surface. The web is cut into individual articles measuring about 140mm x 105 mm rectangles with rounded corners.

Example 127

Prepare a representative skin cleansing article in the following manner.

The Laminate Web of **Example 121** is cut into 200mm x 200mm pieces. The cleansing component **Example 19** is applied to the web with a brush until 0.25g of cleansing component has been applied. The article is dried and stored until required for use. The article is two sided with one soft side and one more abrasive side for deeper cleaning.

Examples 128-132

Prepare a representative skin cleansing and conditioning article using the skin conditioning components of **Examples 36-40**.

The cleansing component of **Example 11** is applied to one side of Laminate Web **Example 119** by extruding it through a coating head continuously in a single line along the center of the web. The cleansing component is extruded at a rate to yield 0.5 grams per finished article. A second substrate web, which is an airlaid, lofty, low density batting, is continuously fed over the first substrate placing it in contact with the cleansing component-containing layer. The batting comprises a blend of 10% 15 denier PET fibers, 50% 3 denier bicomponent fibers with PET core and PE sheath, and 40% 10 denier bicomponent fibers of the same core-sheath composition, and has a basis weight of about 50 grams per square meter (gsm). The webs are continuously fed to an ultrasonic sealer that seals a dot pattern comprising a grid of 4 mm diameter sealing points spaced evenly across the web. Skin conditioning component is slot coated from a hot reservoir pumped through a slot dye onto both sides of the substrate web at a rate equal to 0.25 grams of skin conditioning component per finished article (about 13 gsm add-on), and passed across a cooling fan so the conditioning component cools quickly on the article outer surfaces. The slot coating reservoir is continuously mixed to maintain stability of the emulsion. The web is cut into individual articles measuring about 120 mm x 160 mm rectangles with rounded corners.

Examples 132-136

Prepare a representative skin cleansing and conditioning article using the skin conditioning components of **Examples 27-31**, respectively.

The cleansing component of **Example 11** is applied to one side of Laminate Web **Example 120** by extruding it through a coating head continuously in a single line along the center of the web. The cleansing component is extruded at a rate to yield 0.5 grams per finished article. A second substrate web is continuously fed over the first substrate placing it in contact with the surfactant-containing layer. The second substrate is a 50 gsm hydroentangled 50:50 blend of rayon and polyester available from Dupont. The webs are continuously fed to an ultrasonic sealer that seals a dot pattern comprising a grid of 4 mm diameter sealing points spaced evenly across the web. Skin conditioning component is slot coated from a hot reservoir pumped through a slot dye onto both sides of the substrate web at a rate equal to 0.25 grams of skin conditioning component per finished article (about 13 gsm add-on), and passed across a cooling fan so the component cools quickly on the article outer surfaces. The slot coating reservoir is continuously mixed to maintain stability of the emulsion. The web is cut into individual articles measuring about 200 mm x 130 mm rectangles with rounded corners.

Example 137

Prepare a representative skin cleansing article in the following manner using the liquid cleansing component of **Example 8**.

The liquid cleansing component is applied to a first substrate by dipping a 150 mm by 115 mm section of the substrate in a bath of the composition until it has increased its weight by about 8 grams. The substrate is a through air bonded batting comprising polyester fibers and has a basis weight of about 100 grams per square meter (gsm). The substrate is dried. A piece of a second substrate which is the Laminate Web of **Example 119** is placed over the first substrate. A second piece of the Laminate Web of **Example 119** is placed under the first substrate. The substrates are sealed together using an ultrasonic sealer that seals a dot pattern comprising a grid of 4 mm diameter sealing points spaced evenly across the article. The substrate is cut to a 140 mm by 105 mm rectangle with rounded corners.

Examples 138-141

Prepare a representative cleansing article in the following manner using the Laminate Webs of **Examples 117, 118, 119, , and 123**, respectively.

The cleansing component of **Example 11** is applied to one side of a first substrate by extruding it through a coating head continuously in four lines separated by a distance of 20 mm. The cleansing component is extruded at a rate to yield 4.4 grams of cleansing component per finished article. The substrate is an airlaid, lofty, low density batting which comprises a blend of 30% 15 denier PET fibers, 35% 3 denier bicomponent fibers with PET core and PE sheath, and 35% 10 denier bicomponent fibers of the same core-sheath composition, and has a basis weight of about 85 grams per square meter (gsm). A second substrate web that is the laminate web is continuously fed over the first substrate placing it in contact with the surfactant-

containing layer. The webs are continuously fed to an ultrasonic sealer that seals a dot pattern comprising a grid of 4 mm diameter sealing points spaced evenly across the web. The web is cut into individual articles measuring about 120 mm x 160 mm rectangles with rounded corners.

Examples 142-146

Prepare a representative cleansing and conditioning article as below using the skin conditioning components of **Examples 22-26**.

The cleansing component of **Example 11** is applied to one side of a first substrate by extruding it through a coating head continuously in four lines separated by a distance of 20 mm, measuring widthwise across the. The cleansing component is extruded at a rate to yield 4.4 grams of cleansing component per finished article. The substrate is an airlaid, lofty, low density batting comprising a blend of 30% 15 denier PET fibers, 35% 3 denier bicomponent fibers with PET core and PE sheath, and 35% 10 denier bicomponent fibers of the same core-sheath composition, and has a basis weight of about 85 grams per square meter (gsm). A second substrate is continuously fed over the first substrate placing it in contact with the surfactant-containing layer. This second substrate is the same as the first. A third substrate web which is the Laminate Web of **Example 119** is continuously fed over the second substrate web placing it in contact with the second substrate. The webs are continuously fed to an ultrasonic sealer that seals a dot pattern comprising a grid of 4 mm diameter sealing points spaced evenly across the web. Skin conditioning component is dot coated from a hot reservoir pumped through an extrusion jetting head onto both sides of the web at a rate equal to 2 grams of skin conditioning component per finished article. The component is distributed in dots each containing about 0.1g of conditioning component and having a diameter of about 4mm and located in some of the sealing points. The article is passed across a cooling fan so the conditioning component cools quickly on the article outer surfaces. The web is cut into individual articles measuring about 140 mm x 105 mm rectangles with rounded corners.

Examples 147-151

Prepare a representative cleansing and conditioning article as below using the skin conditioning components of **Examples 41-45**.

The cleansing component of **Example 11** is applied to one side of a first substrate by extruding it through a coating head continuously in four lines separated by a distance of 20 mm. The cleansing component is extruded at a rate to yield 4.0 grams of cleansing component per finished article. The substrate is an airlaid, lofty, low density batting comprising a blend of 30% 15 denier PET fibers, 35% 3 denier bicomponent fibers with PET core and PE sheath, and 35% 10 denier bicomponent fibers of the same core-sheath composition, and has a basis weight of about 85 grams per square meter (gsm). A second substrate is continuously fed over the first substrate placing it in contact with the surfactant-containing layer. This second substrate is the same as the first. A third substrate web that is the Laminate Web of **Example 117** is continuously fed over the second substrate web placing it in contact with the second substrate. The webs are continuously fed to an ultrasonic sealer that seals a dot pattern comprising a grid

of 4 mm diameter sealing points spaced evenly across the web. Skin conditioning component is dot coated from a hot reservoir pumped through an extrusion jetting head onto the laminate web at a rate equal to 2 grams of skin conditioning component per finished article. The conditioning component is distributed in dots each containing about 0.1g of component and having a diameter of about 4mm and located in some of the sealing points. The article is passed across a cooling fan so the component cools quickly on the article outer surfaces. The web is cut into individual articles measuring about 140 mm x 105 mm rectangles with rounded corners.

#### Examples 152-154

Prepare a representative skin cleansing and conditioning article as follows, utilizing the skin conditioning components of **Examples 57-59**.

The cleansing component of **Example 12** is applied to one side of a first substrate by extruding it through a coating head continuously in four lines separated by a distance of 20 mm. The cleansing component is extruded at a rate to yield 4.0 grams of cleansing component per finished article. The substrate is an airlaid, lofty, low density batting comprising a blend of 30% 15 denier PET fibers, 35% 3 denier bicomponent fibers with PET core and PE sheath, and 35% 10 denier bicomponent fibers of the same core-sheath composition, and has a basis weight of about 85 grams per square meter (gsm). A second substrate is continuously fed over the first substrate placing it in contact with the cleansing component-containing web. This second substrate is the same as the first. A third substrate web that is the Laminate Web of **Example 117** is continuously fed over the second substrate web placing it in contact with the second substrate. The webs are continuously fed to an ultrasonic sealer that seals a dot pattern comprising a grid of 4 mm diameter sealing points spaced evenly across the web. Skin conditioning component is slot coated from a hot reservoir pumped through a slot dye onto both sides of the substrate web at a rate equal to 2 grams of skin conditioning component per finished article (about 68 gsm add-on), and passed across a cooling fan so the component cools quickly on the article outer. The article is passed by a cooling fan so the component cools quickly on the article outer surfaces. The web is cut into individual articles measuring about 140 mm x 105 mm rectangles with rounded corners.

#### Examples 155-156

Prepare a representative cleansing and conditioning article using the conditioning components of **Examples 29-30**.

The cleansing component of **Example 12** is applied to one side of a first substrate by extruding it through a coating head continuously in four lines separated by a distance of 20 mm, 40 mm, and 20 mm respectively, measuring widthwise across the web, making a pair of parallel lines on each side of the web. The cleansing component is extruded at a rate to yield 4.4 grams of cleansing component per finished article. The substrate is an airlaid, lofty, low density batting comprising 10d Polyester fibers, and has a basis weight of about 100 grams per square meter (gsm). A second substrate is continuously fed over the first substrate placing it in contact with the surfactant-containing layer. This second substrate is the Laminate Web of **Example**

118. The webs are continuously fed to an ultrasonic sealer that seals a dot pattern comprising a grid of 4 mm diameter sealing points spaced evenly across the web. The articles are cut to 120 mm x 160 mm rectangles with rounded corners. 2g of the skin conditioning component are applied to the article on to the laminate web. The component is applied to the article as a hot liquid (60-70°C) using a pipette such that the coating is in the form of dots of about 4mm diameter. Each dot contains about 0.1g composition and these dots are located in some of the sealing points.

#### Examples 157-159

Prepare representative skin cleansing and conditioning articles with the cleansing components of **Examples 1, 2 and 5** in the following manner.

Eight grams of cleansing component is applied to one side of a permeable, fusible web comprised of low-melting heat-sealable fibers in four quadrants forming a rectangle about 10 inches by 12 inches, leaving space at the edge and between quadrants to seal layers without the presence of surfactant. The permeable web is a fibrous, low density polyethylene (LDPE or LLDPE) material commonly available from sewing supply distributors. A layer of 4 oz/sq yd polyester batting cut to the same size as the web is placed over the fusible web. The polyester batting has a basis weight of 4 oz/yd<sup>2</sup> and is comprised of polyester fibers of about 30 microns average diameter and is adhesive bonded, available for example as Mountain Mist Extra Heavy Batting #205 from Stearns Textiles, Cincinnati, OH. A layer of the Laminate Web of **Example 123** is placed under the fusible web with the carded nonwoven making up the outer surface of the article. The layers are sealed together in a rectangular windowpane shape with a heat sealing die utilizing a pressure-platen heat sealing device such as a Sentinel Model 808 heat sealer available from Sencorp, Hyannis, MA with sufficient temperature and pressure to cause the batting to melt and flow into the first layer and hence form an adequate seal, usually about 300°F and 30 psi machine pressure sealing for 6-10 seconds is sufficient. The seal is continuous around the edges and has a single windowpane cross-member in each X- and Y-direction measuring about 2 mm width. After cooling, three grams of the skin conditioning component of **Example 22** is applied to one side of the finished article. The conditioning component is applied as a hot liquid (70-80°C) using an extrusion jetting head such that the coating is in the form of dots of about 7mm diameter. Each dot contains about 0.3g of conditioning component. The article is trimmed and the corners rounded and it is stored until ready for use.

#### Examples 160-163

Prepare representative skin cleansing and conditioning articles with the hotmelt cleansing components of **Examples 7, 13, 14, and 15** in the following manner.

The hotmelt cleansing component is continuously added to a web by slot coating the component evenly across the web at a rate of about 80 gsm. The web is a lofty airlaid batting comprising a blend of 40% 15 denier Polyester fibers, 30% 3 denier bicomponent fibers with PET core and PE sheath, and 30% 10 denier bicomponent fibers of the same core-sheath composition, and has a basis weight of about 85 grams per square meter (gsm). A second

substrate is continuously fed over the first substrate placing it in contact with the surfactant-containing layer. This second substrate is the Laminate Web of **Example 121**. The webs are continuously fed to an ultrasonic sealer that seals a dot pattern comprising a grid of 4 mm diameter sealing points spaced evenly across the web. The skin conditioning component of **Example 26** is added to the web by dot coating the conditioning component across the both sides of the article at a rate of about 3g per finished article. The dots each contain about 0.1g of component and are about 5mm in diameter, the dots of conditioning component are located together in a patch such that they are in the center of the finished article. The substrate web is cut into individual articles measuring about 120 mm x 160 mm rectangles with rounded corners.

#### Example 164

Prepare a representative skin cleansing article in the following manner.

The cleansing component of **Example 11** is applied to one side of a first substrate by extruding it through a coating head continuously in four lines separated by a distance of 20 mm, measuring widthwise across the web. The cleansing component is extruded at a rate to yield 4.0 grams of cleansing component per finished article. The substrate is an airlaid, lofty, low density batting comprising a blend of 30% 15 denier PET fibers, 35% 3 denier bicomponent fibers with PET core and PE sheath, and 35% 10 denier bicomponent fibers of the same core-sheath composition, and has a basis weight of about 85 grams per square meter (gsm). A second substrate is continuously fed over the first substrate placing it in contact with the surfactant-containing layer. This second substrate is a blend of polyester and pulp fibers with a basis weight of about 120 grams per square meter (gsm). A third substrate is fed over the second. The third substrate is the Laminate Web of **Example 119**. The webs are continuously fed to an ultrasonic sealer which seals a dot pattern comprising a grid of 4 mm diameter sealing points spaced evenly across the web. The articles are cut to 140 mm x 105 mm rectangles with rounded corners.

#### Example 165

Prepare a representative skin cleansing and conditioning article in the following manner.

The cleansing component of **Example 11** is applied to one side of a first substrate by extruding it through a coating head continuously in four lines separated by a distance of 20 mm, measuring widthwise across the web. The cleansing component is extruded at a rate to yield 4.0 grams of cleansing component per finished article. The substrate is an airlaid, lofty, low density batting comprising a blend of 30% 15 denier PET fibers, 35% 3 denier bicomponent fibers with PET core and PE sheath, and 35% 10 denier bicomponent fibers of the same core-sheath composition, and has a basis weight of about 85 grams per square meter (gsm). A second substrate is continuously fed over the first substrate placing it in contact with the cleansing component-containing layer. This second substrate is a blend of polyester and pulp fibers with a basis weight of about 120 grams per square meter (gsm). A third substrate is fed over the second. The third substrate is an airlaid, lofty, low density batting comprising a blend of 30% 15 denier PET fibers, 35% 3 denier bicomponent fibers with PET core and PE sheath, and 35%

10 denier bicomponent fibers of the same core-sheath composition, and has a basis weight of about 85 grams per square meter (gsm). A fourth substrate web is fed over the third web, which is the Laminate Web of **Example 117**. The webs are continuously fed to an ultrasonic sealer, which seals a dot pattern comprising a grid of 4 mm diameter sealing points spaced evenly across the web.

#### Examples 166-170

Prepare a representative skin cleansing and conditioning article in the following manner. The cleansing component of **Example 11** is applied to one side of a first substrate by extruding it through a coating head continuously in four lines separated by a distance of 20 mm, measuring widthwise across the web. The cleansing component is extruded at a rate to yield 4.0 grams of cleansing component per finished article. The substrate is an airlaid, lofty, low density batting comprising a blend of 30% 15 denier PET fibers, 35% 3 denier bicomponent fibers with PET core and PE sheath, and 35% 10 denier bicomponent fibers of the same core-sheath composition, and has a basis weight of about 85 grams per square meter (gsm). A second substrate is continuously fed over the first substrate placing it in contact with the cleansing component-containing layer. This second substrate is a blend of polyester and pulp fibers with a basis weight of about 120 grams per square meter (gsm). A third substrate is fed over the second. The third substrate is an airlaid, lofty, low density batting comprising a blend of 30% 15 denier PET fibers, 35% 3 denier bicomponent fibers with PET core and PE sheath, and 35% 10 denier bicomponent fibers of the same core-sheath composition, and has a basis weight of about 85 grams per square meter (gsm). A fourth substrate web is fed over the third web, which is the Laminate Web of **Example 117**. The webs are rewound. A length of web is cut and sealed together using an ultrasonic sealer, which seals a dot pattern comprising a grid of 4 mm diameter sealing points spaced evenly across the web. 2 grams of skin conditioning compositions of any one of **Examples 22-26** is dot coated on to the articles on both sides using an X-Y Table, which is a programmable controlled metering system comprising a heated reservoir maintained at about 70°C, a pump, an on-off valve a multi pipette head and a motorized X-Y coordinate control system for the coating head. The dots contain about 0.1g of conditioning system and are about 4mm in diameter. The component cools quickly on the surface of the article. The articles are packaged until ready for use.

#### Examples 171-172

Prepare representative skin cleansing and conditioning articles with the surfactant powders (cleansing component) of **Examples 3 and 4** in the following manner.

Four grams of dry surfactant powder is applied to one side of a permeable, fusible web comprised of low-melting heat-sealable fibers. The permeable web is Wonder Under manufactured by Pellon, available from H. Levinson & Co., Chicago, IL. The powder is sprinkled evenly over an oval area approximately 17 cm by 19 cm. A layer of 2 oz/sq yd polyester batting cut to the same size as the web is placed over the fusible web. The polyester batting has a basis weight of 2 oz/yd<sup>2</sup> and comprises a blend of fibers of about 23 microns and 40

microns average diameter, at least some of which are crimped. The thickness of the batting is about 0.23 in. measured at 5 gsi. The batting has an air permeability of about 1270 cfm/ft<sup>2</sup> and a foam permeability critical pressure of about 2.7 cm H<sub>2</sub>O. The batting is believed to be heat-bonded, utilizing no adhesive. A second substrate layer that is the Laminate Web of **Example 118** is cut to the same size as the fusible web. The second layer is placed under the fusible web and the layers are sealed together using point bonds and also a 2 mm wide seal around the perimeter with a heat sealing die utilizing a pressure-platen heat sealing device such as a Sentinel Model 808 heat sealer available from Sencorp, Hyannis, MA. The point bonds measure about 3 mm diameter each and there are about 51 individual sealing points evenly spaced. The article is trimmed, and 2.5 grams of the skin conditioning component of any one of **Examples 32, 33, 34, or 35** is applied to one side of the finished article. The composition is applied as a hot liquid (about 50°C) to the article surfaces using a pipette such that the coating is in the form of dots, each containing about 0.1g component and these dots are located in some of the sealing points. The component quickly cools on the article surface and is stored in a sealed, metallized film package until ready for use.

#### Example 173

Prepare a representative skin cleansing article in the following manner.

Four grams of the cleansing component of **Example 11** is applied to one side of a permeable, fusible web comprised of low-melting heat-sealable polyamide fibers. The permeable web is Wonder Under manufactured by Pellon, available from H. Levinson & Co., Chicago, IL. The cleansing component is applied to an oval area approximately 13 cm by 18 cm. The cleansing component is air dried. A layer of 2 oz/sq yd polyester batting cut to the same size as the web is placed over the fusible web. The polyester batting has a basis weight of 2 oz/yd<sup>2</sup> and is comprised of a blend of fibers of about 23 microns and 40 microns average diameter, at least some of which are crimped. The batting is believed to be heat-bonded, utilizing no adhesive. A layer of the Laminate Web of **Example 123** is laid on the opposite surface of the fusible web. The shape of the article is about 122 mm x 160 mm oval. The layers are sealed together using point bonds in a grid pattern with a heat sealing die utilizing a pressure-platen heat sealing device such as a Sentinel Model 808 heat sealer available from Sencorp, Hyannis, MA. The point bonds measure about 4 mm diameter each and there are about 51 individual sealing points evenly spaced. The article is trimmed and ready for use.

#### Examples 174-194

Prepare representative skin cleansing and conditioning articles utilizing the skin conditioning components of **Examples 36-56** in the following manner.

The cleansing component of **Example 11** is applied to one side of a first substrate by extruding it through a coating head continuously in four lines separated by a distance of 20 mm, 40 mm, and 20 mm respectively, measuring widthwise across the web, making a pair of parallel lines on each side of the web. The cleansing component is extruded at a rate to yield 4.0 grams of cleansing component per finished article. The substrate is an airlaid, lofty, low density

batting comprising of polyester fibers and having a basis weight of 100 grams per square meter (gsm). A second substrate, the Laminate Web of **Example 120** is fed over the first substrate placing it in contact with the cleansing component layer. The webs are continuously fed to an ultrasonic sealer that seals a dot pattern comprising a grid of 4 mm diameter sealing points spaced evenly across the web. Skin conditioning component is bead coated from a hot reservoir pumped through an extrusion jetting head onto both sides of the substrate web at a rate equal to 3 grams of skin conditioning component per finished article (about 140 gsm add-on per side) in dots each containing about 0.2g of conditioner and located in the sealing points. It is then passed across a cooling fan so the component cools quickly on the article outer surfaces. The coating reservoir is continuously mixed to maintain stability of the emulsion. The web is cut into individual articles measuring about 120 mm x 160 mm rectangles with rounded corners.

#### Examples 195-197

Prepare representative skin cleansing articles with the liquid cleansing component of **Examples 6, 9 and 10**.

Liquid cleansing component is applied to one side of a first substrate by coating with a brush until 2 grams of the cleansing component has solidified and been applied, in a windowpane design avoiding the edges and the sealing loci. The substrate is an airlaid, lofty, low density batting comprising a blend of 30% 15 denier PET fibers, 35% 3 denier bicomponent fibers with PET core and PE sheath, and 35% 10 denier bicomponent fibers of the same core-sheath composition, and has a basis weight of about 100 grams per square meter (gsm). The cleansing component is dried. The second substrate, the Laminate web of **Example 120**, is laid over the first substrate. The layers are sealed together in a rectangular windowpane shape with a heat sealing die utilizing a pressure-platen heat sealing device such as a Sentinel Model 808 heat sealer available from Sencorp, Hyannis, MA with sufficient temperature and pressure to form an adequate seal. The seal is continuous around the edges and has a single windowpane cross-member in each X- and Y-direction measuring about 2 mm width. The article is trimmed to size of 200mm x 180mm.

#### Examples 198-200

Prepare representative skin cleansing articles with the skin conditioning components of **Examples 60-62**.

The liquid cleansing component of **Example 10** is applied to one side of a first substrate by coating with a brush until 2 grams of cleansing component has solidified and has been applied, in a windowpane design avoiding the edges and the sealing loci. The first substrate is an airlaid, lofty, low density batting comprising a blend of 30% 15 denier PET fibers, 35% 3 denier bicomponent fibers with PET core and PE sheath, and 35% 10 denier bicomponent fibers of the same core-sheath composition, and has a basis weight of about 100 grams per square meter (gsm). The cleansing component is dried. A second substrate that is the Laminate web of **Example 120** is laid over the first substrate. The layers are sealed together in a rectangular windowpane shape with a heat sealing die utilizing a pressure-platen heat sealing device such as

a Sentinel Model 808 heat sealer available from Sencorp, Hyannis, MA with sufficient temperature and pressure to form an adequate seal. The seal is continuous around the edges and has a single windowpane cross-member in each X- and Y-direction measuring about 2 mm width. The article is trimmed, and 1.5 grams of skin conditioning component is applied to the lofty batting side of the article by feeding the component through a slotted rolling device with a machined 1.5 mm gap and a feed reservoir held at about 60°C. The component quickly cools on the article surface and is stored in a sealed, metallized film package until ready for use.

#### Example 201

Prepare a representative skin cleansing article in the following manner using the cleansing component of **Example 11** and the Laminate Webs of **Examples 123 and 121**.

The cleansing component of **Example 11** is applied to one side of a first substrate by extruding it through a coating head continuously in four lines separated by a distance of 20 mm across the web. The cleansing component is extruded at a rate to yield 4.0 grams of cleansing component per finished article. The substrate is an airlaid, lofty, low density batting which comprises a blend of 30% 15 denier PET fibers, 35% 3 denier bicomponent fibers with PET core and PE sheath, and 35% 10 denier bicomponent fibers of the same core-sheath composition, and has a basis weight of about 85 grams per square meter (gsm). A second substrate web, the Laminate Web of **Example 121**, is continuously fed over the first substrate placing it in contact with the surfactant-containing layer. The laminate web is arranged such that the more abrasive formed film side forms the surface of the article. A third substrate web, which is the Laminate Web of **Example 123**, is continuously fed below the first substrate with carded nonwoven on the outer surface on the article. The webs are continuously fed to an ultrasonic sealer that seals a dot pattern comprising a grid of 4 mm diameter sealing points spaced evenly across the web. The articles are individually cut to size to 120mm x 160mm rectangles with rounded corners and has different feels on the two surfaces.

#### Example 202

Prepare a representative skin cleansing and conditioning article in the following manner.

Four grams of the skin conditioning component of **Example 57** is applied, half to each side, to the finished article of **Example 173**. The composition is applied as a hot liquid (60-70°C) using an extrusion jetting head to create two stripes of coating 5mm wide and 100mm long, 2 cm apart on each side of the article.

#### Example 203

Prepare a representative skin cleansing and conditioning article in the following manner.

Three grams of the skin conditioning component of any one of **Examples 69-72** is applied, half to each side, of the finished article of **Example 173**. The component is applied by slot coating the component as a hot liquid (60-70°C) to the article surfaces evenly, half of the component on each side of the article.

#### Example 204

Prepare a representative skin cleansing article in the following manner.

The cleansing component of **Example 11** is applied to one side of a first substrate by extruding it through a coating head continuously in four lines separated by a distance of 20 mm, measuring widthwise across the. The cleansing component is extruded at a rate to yield 4.4 grams of cleansing component per finished article. The first substrate is an airlaid, lofty, low density batting comprising a blend of 30% 15 denier PET fibers, 35% 3 denier bicomponent fibers with PET core and PE sheath, and 35% 10 denier bicomponent fibers of the same core-sheath composition, and has a basis weight of about 85 grams per square meter (gsm). A second substrate is continuously fed over the first substrate placing it in contact with the cleansing component-containing layer. This second substrate is the same as the first. A third substrate web, the **Laminate Web of Example 119**, is continuously fed over the second substrate web placing it in contact with the second substrate. The webs are continuously fed to an ultrasonic sealer that seals a dot pattern comprising a grid of 4 mm diameter sealing points spaced evenly across the web. The web is cut into individual articles measuring about 140 mm x 105 mm rectangles with rounded corners.

#### Example 205

Prepare a representative skin cleansing and conditioning kit in the following manner.

Prepare the representative cleansing article of **Example 204**.

Prepare a skin conditioning article by applying the conditioning component of any one of **Examples 22-89** to one side of a first substrate by extruding it through a coating head continuously in four strips, each 5 mm wide, separated by a distance of 20 mm, 40 mm, and 20 mm respectively, measuring widthwise across the web, making a pair of parallel lines on each side of the web. The component is extruded at a rate to yield 3 grams of component per finished article. The substrate is a spunlace blend of 70% rayon and 30% PET fibers, bonded with a styrene-butadiene adhesive, which is hydroapertured to form holes about 2 mm in diameter and having a basis weight of about 70 gsm. A second web which is an airlaid, lofty, low density batting is continuously fed over the first substrate placing it in contact with the first substrate on the side containing no skin conditioning component. The batting comprises a blend of 30% 15 denier PET fibers, 35% 3 denier bicomponent fibers with PET core and PE sheath, and 35% 10 denier bicomponent fibers of the same core-sheath composition, and has a basis weight of about 100 grams per square meter (gsm). The webs are continuously fed to an ultrasonic sealer that seals a dot pattern comprising a grid of 4 mm diameter sealing points spaced evenly across the web. The web is cut into individual articles measuring about 120 mm x 160 mm rectangles with rounded corners, which has a total of about 51 sealing points per article.

The skin cleansing article and the skin conditioning article are packaged together in a single package.

#### Example 206

Prepare a representative skin cleansing article in the following manner using the cleansing component of **Example 11**.

2g of the cleansing component is spread on to the first substrate in a rough oval of dimensions 5cm x 8cm. The substrate is a Polyether foam available from General Foam which has a thickness of 320 mils. A piece of a second substrate which is the Laminate Web of **Example 117** is placed over the first substrate. A second piece of the Laminate Web of **Example 117** is placed under the first substrate. The substrates are sealed together using an ultrasonic sealer that seals a dot pattern comprising a grid of 4 mm diameter sealing points spaced evenly across the article. The substrate is cut to a 140 mm by 105 mm rectangle with rounded corners.

#### Example 207

Prepare a representative skin cleansing article in the following manner.

The cleansing component of **Example 11** is applied to one side of a first substrate by extruding it through a coating head continuously in four lines separated by a distance of 20 mm, measuring widthwise across the web. The cleansing component is extruded at a rate to yield 4.0 grams of cleansing component per finished article. The first substrate is an airlaid, lofty, low density, resin bonded batting comprising Polyester fibers available as Polystar AB1 from Libeltex NV, Belgium. The substrate has a basis weight of about 80 grams per square meter (gsm). A second substrate is continuously fed over the first substrate placing it in contact with the cleansing component-containing layer. This second substrate is the Laminate Web of **Example 120**. A third substrate, is continuously below the first substrate web. The third substrate is also the Laminate web of **Example 120**. The webs are continuously fed to an ultrasonic sealer that seals a dot pattern comprising a grid of 4 mm diameter sealing points spaced evenly across the web. The web is cut into individual articles measuring about 140 mm x 105 mm rectangles with rounded corners.

#### Example 208

A representative skin cleansing and drying kit for children is prepared by packaging the article of **Example 142** with a 300mm x 400mm piece of the Laminate Web of **Example 118** or **Example 122**.

#### Example 209

A representative antibacterial hard surface cleaning article, e.g., wet wipe, having antibacterial properties is prepared by saturating the Laminate Web of any one of **Examples 117-124** with any one of the cleaning components shown in **Examples 106-115**. Preferably, the components are loaded onto the web at a loading factor of about 3.2 to form a premoistened wipe article. The resulting wipe articles may then be packaged individually or in multipacks.

#### Example 210

A representative antibacterial hard surface cleaning wet wipe is prepared by saturating the Laminate Web of any one of **Examples 117-124** with either of the antibacterial cleaning components of **Examples 21 and 22**. The resulting wipe articles may then be packaged individually or in multipacks.

Example 211

A representative conditioning article is prepared in the following manner.

The conditioning component of any of **Examples 22-89** is applied to one side of any one of the Laminate Webs of **Examples 117-124** by extruding it through an extrusion jetting head to form dots each containing about 0.05g of component and of about 3mm diameter. The component is extruded at a rate to yield 1.1 grams of component per finished article. A second web which is an airlaid, lofty, low density batting is continuously fed over the first substrate placing it in contact with the first substrate on the side containing no skin conditioning component. The batting comprises a blend of 10% 15 denier PET fibers, 50% 3 denier bicomponent fibers with polyethylene terephthalate (PET) core and polyethylene (PE) sheath, and 40% 10 denier bicomponent fibers of the same core-sheath composition, and has a basis weight of about 80 grams per square meter (gsm). The webs are continuously fed to an ultrasonic sealer that seals a dot pattern comprising a grid of 4 mm diameter sealing points spaced evenly across the web. The web is cut into individual articles measuring about 120 mm x 90 mm rectangles with rounded corners, which has a total of about 51 sealing points per article. The article is convenient for application to smaller areas of skin, for example the face, elbows, neck and/or feet.

Example 212

A representative floor cleaning article is prepared in the following manner.

Cut the Laminate Web of any one of **Examples 117-124** into a 100x130mm pad. Attach a poly barrier provided by Clopay to the backside of the sheet. Attach 2x25mm wide attachment strips along the length of the pad to attach the pad to an implement. Cut a Swiffer dry dusting mop head down to 100 x 130 mm dimension (includes swivel head to create mopping action). To this mop head, glue a male Velcro strip to provide means for attaching the pad. Saturate the mop head with any one of the cleaning components of **Examples 92-105**. Package mop head such that components is not released prior to consumer use.

Example 213

A representative floor polishing/dusting article is prepared in the following manner.

Cut a Laminate Web of any one of **Examples 117-124** into a 100x130mm pad. Attach a poly barrier provided by Clopay to the backside of the sheet. Attach 2x25 mm wide attachment strips along the length of the pad to attach the pad to an implement. Cut a Swiffer™ dry dusting mop head down to 100 x 130 mm dimension (includes swivel head to create mopping action). To this mop head, glue a male Velcro strip to provide means for attaching the pad. Prior to attaching the pad to the mop head, load pad with a polishing dusting component containing a mixture of mineral and wax in a 1:1 weight ratio. Once pad has been loaded with the component, package the resulting article until ready for use.

Example 214

A representative polishing/dusting article is prepared in the following manner.

Cut a Laminate Web of any one of **Examples 117-124** into a 100x130 mm pad. Load pad with a polishing dusting component containing a mixture of mineral and wax in a 1:1 weight. Once pad has been loaded with the component, package the resulting article until ready for use.

Example 215

A representative fabric cleaning/refreshing article is prepared in the following manner.

Cut a Laminate Web of any one of **Examples 117-124** into a 100x130 sheet. Load the sheet with any one of the cleaning components of **Examples A-E**. Once the sheet has been loaded with the component, package the resulting article until ready for use.

## WHAT IS CLAIMED IS::

1. A disposable article characterized in that said article comprises:
  - a) a laminate web having a plurality of apertures, said laminate web comprising:
    - 1) a first extensible web having a first elongation to break;
    - 2) a second extensible web joined to said first extensible web at a plurality of bond sites, said second extensible web having a second elongation to break; and
    - 3) a third web material being disposed between said first and second webs, said third web material having a third elongation to break which is less than both of said first or second elongations to break;
  - b) a benefit component disposed adjacent to said laminate web.
2. The article of Claim 1 wherein said article is selected from the group consisting of personal care articles, household care articles, vehicle care articles, and pet grooming articles.
3. The article of any one of the preceding claims wherein said laminate web is joined by bonds in the absence of adhesive.
4. The article of any one of the preceding claims wherein said bond sites are selected from the group consisting of discrete thermal bonds and discrete ultrasonic bonds.
5. The article of any one of the preceding claims wherein said first and/or second extensible webs comprise materials selected from the group consisting of nonwovens, polymeric films, and combinations thereof.
6. The article of any one of the preceding claims wherein said first and second extensible webs are identical.
7. The article of any one of the preceding claims wherein said third web comprises material selected from the group consisting of cellulosic tissue paper, metallic foil, polymeric films, foams, and combinations thereof.
8. The article of any one of the preceding claims wherein said benefit component is selected from the group consisting of cleansing components, conditioning components, cosmetic components, cleaning components, polishing/dusting components, and combinations thereof.
9. The article of any one of the preceding claims wherein said benefit component is a cosmetic component that comprises actives selected from the group consisting vitamin compounds,

skin treating agents, anti-acne actives, anti-wrinkle actives, anti-skin atrophy actives, anti-inflammatory actives, topical anesthetics, artificial tanning actives and accelerators, anti-microbial actives, anti-fungal actives, sunscreen actives, anti-oxidants, skin exfoliating agents, deodorant/antiperspirant actives, and combinations thereof.

10. A disposable article characterized in that said article comprises:

- a) a laminate web having a plurality of apertures, said laminate web comprising:
  - 1) first and second extensible webs being joined at a plurality of discrete bond sites;
  - 2) a third material disposed between said first and second nonwoven webs; and
- b) a benefit component disposed adjacent to said laminate web; and

wherein the first and second extensible webs are in fluid communication via the apertures and have distinct regions that are differentiated by at least one property selected from the group consisting of basis weight, fiber orientation, thickness, and density.

1/10

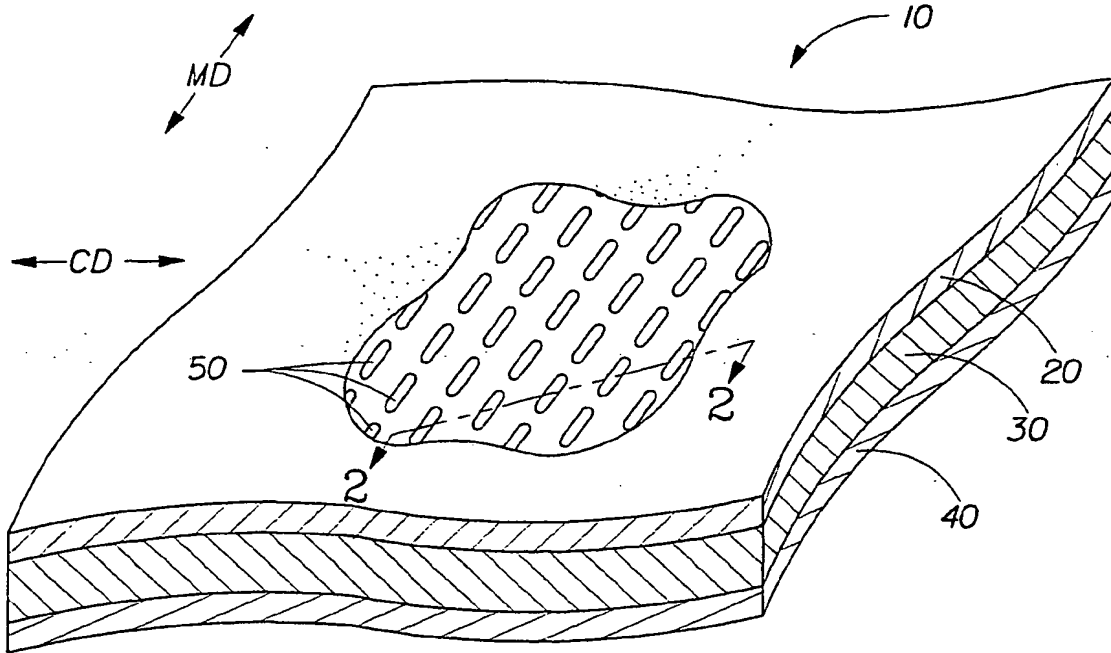


Fig. 1

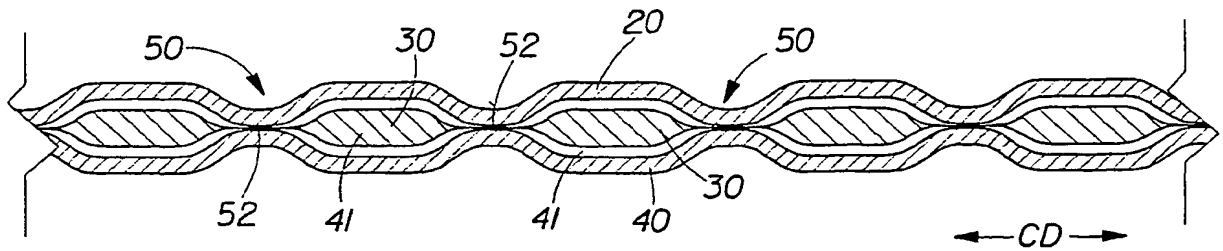


Fig. 2

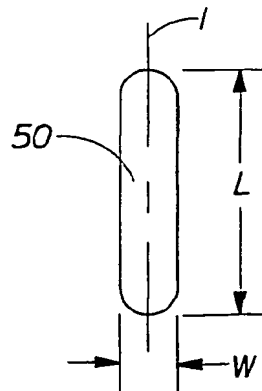


Fig. 3

2/10

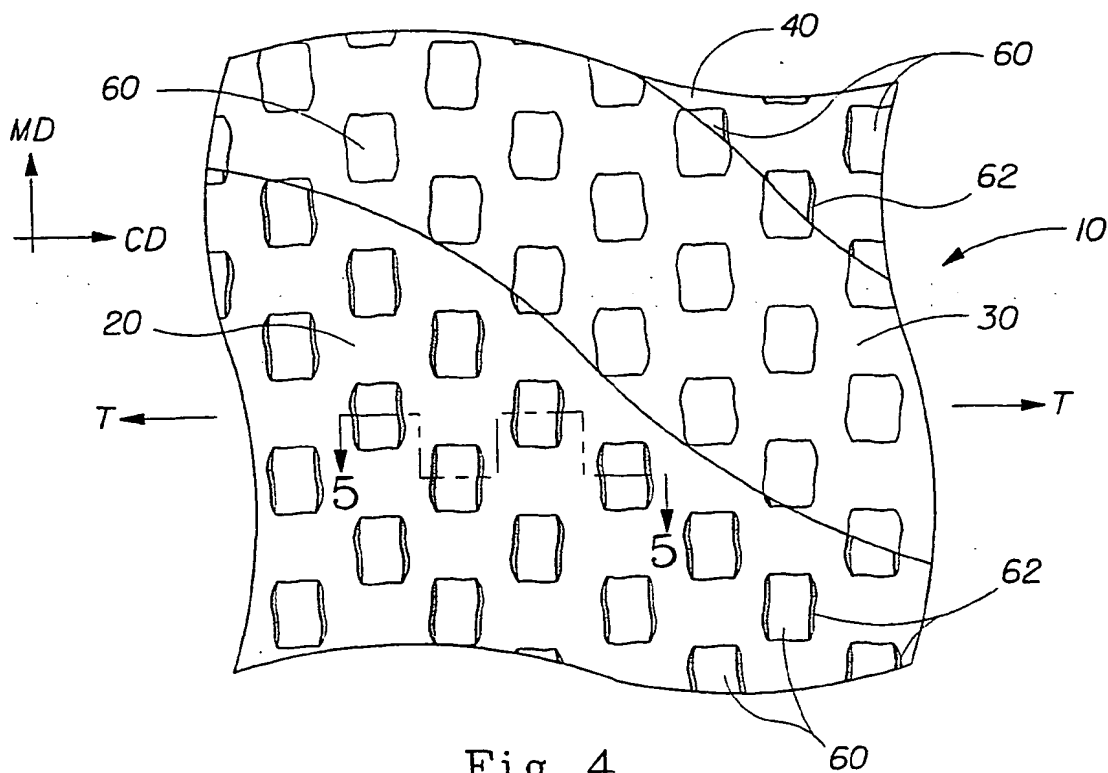


Fig. 4

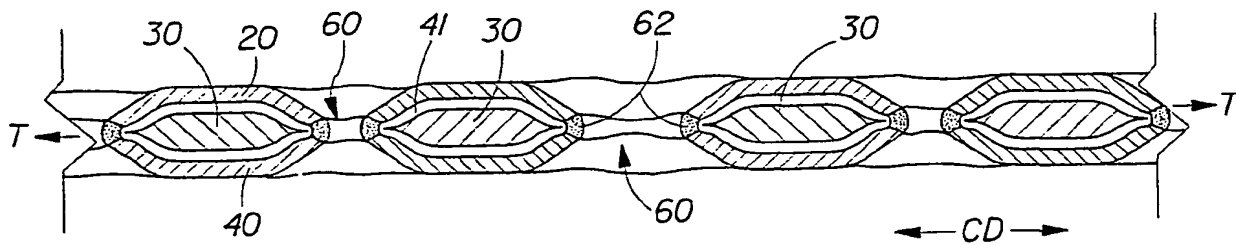
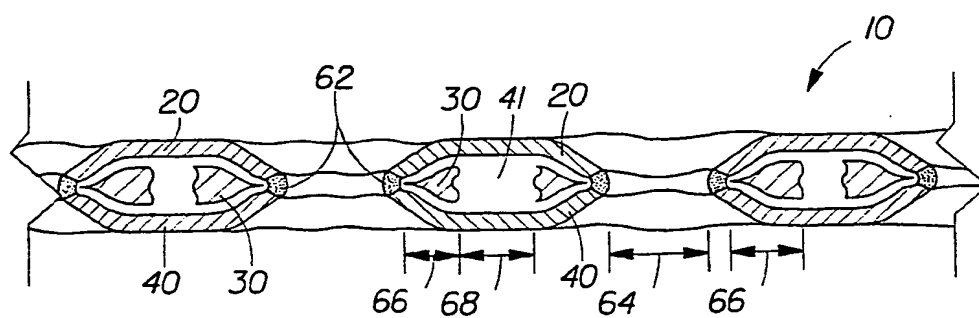
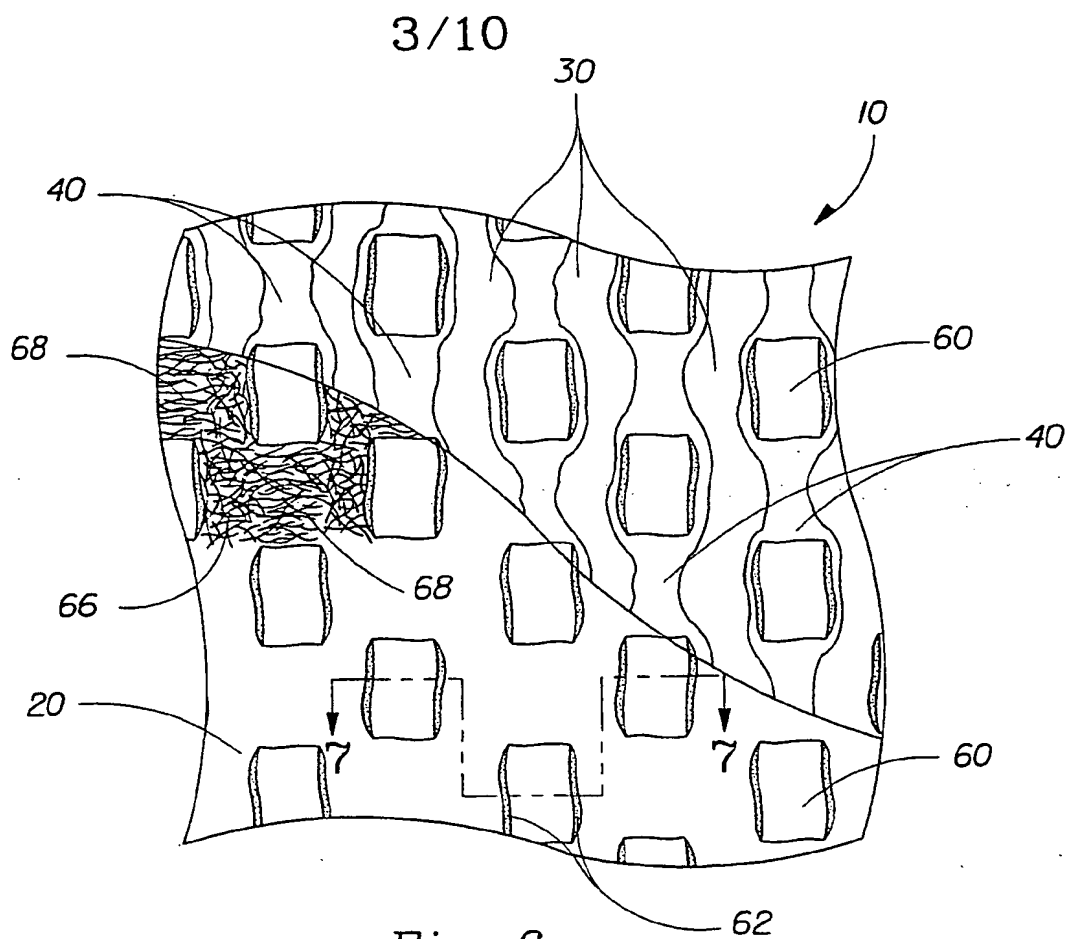


Fig. 5



4/10

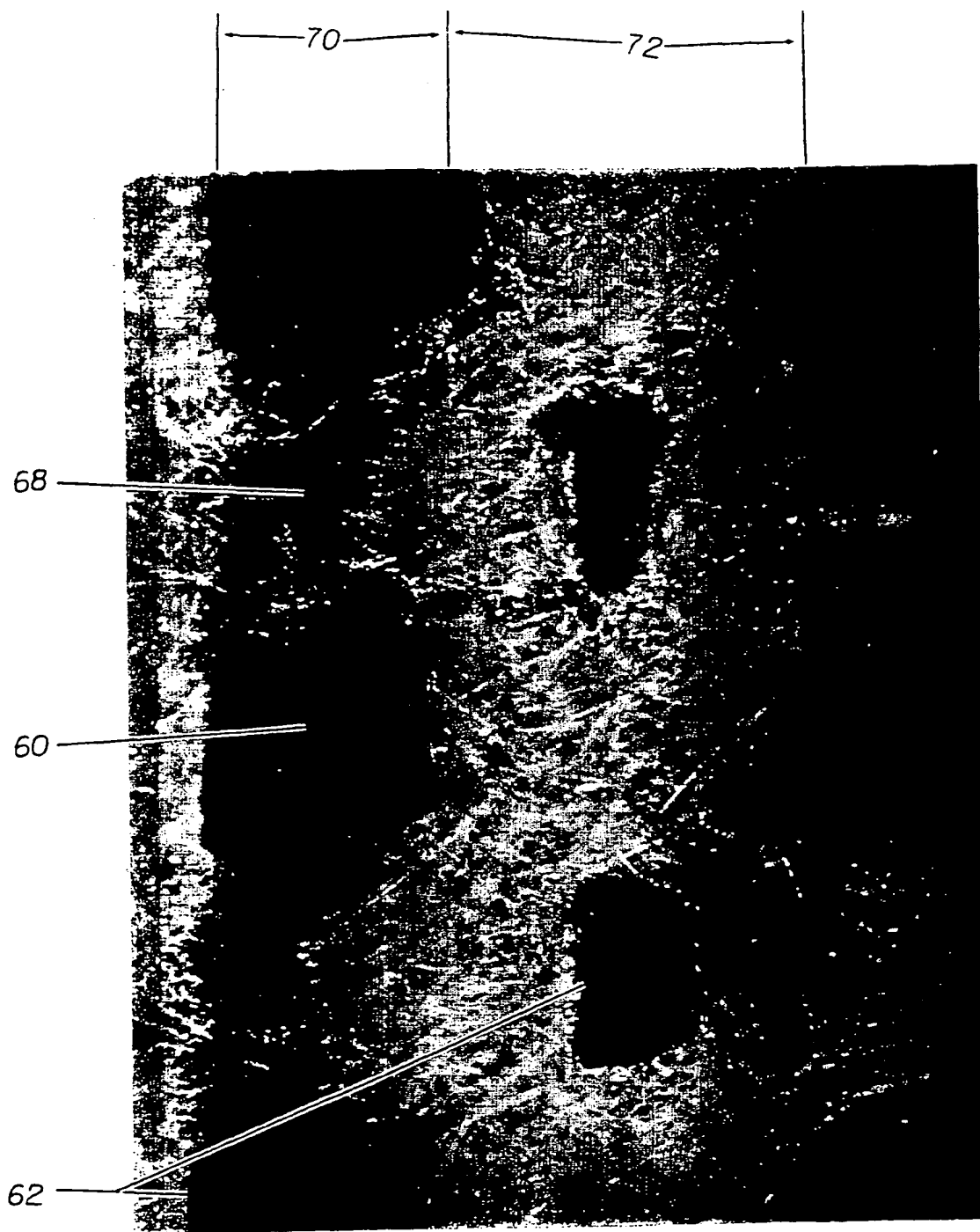


Fig. 8

5/10

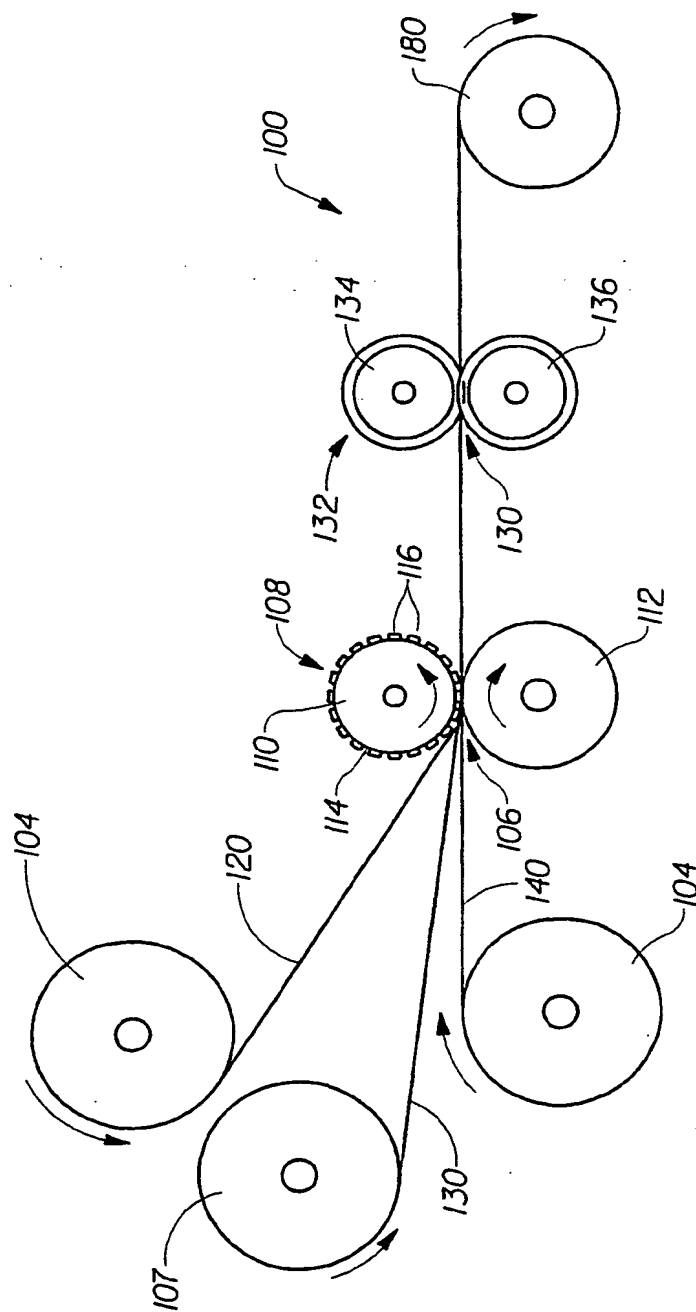


Fig. 9

6/10

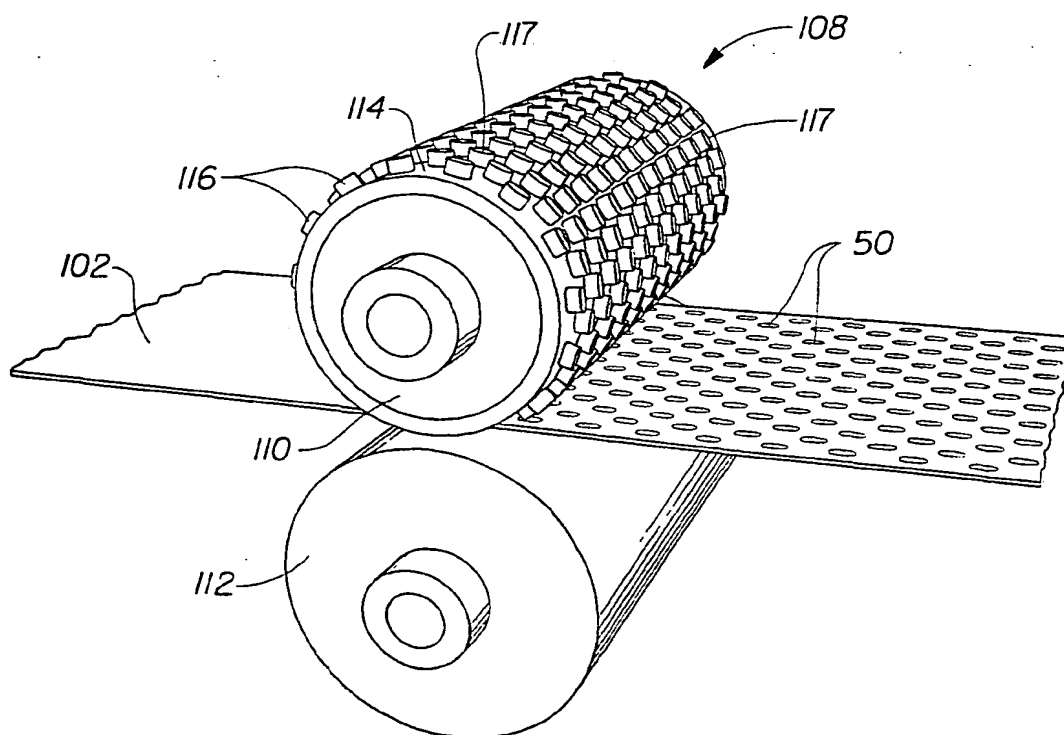


Fig. 10

7/10

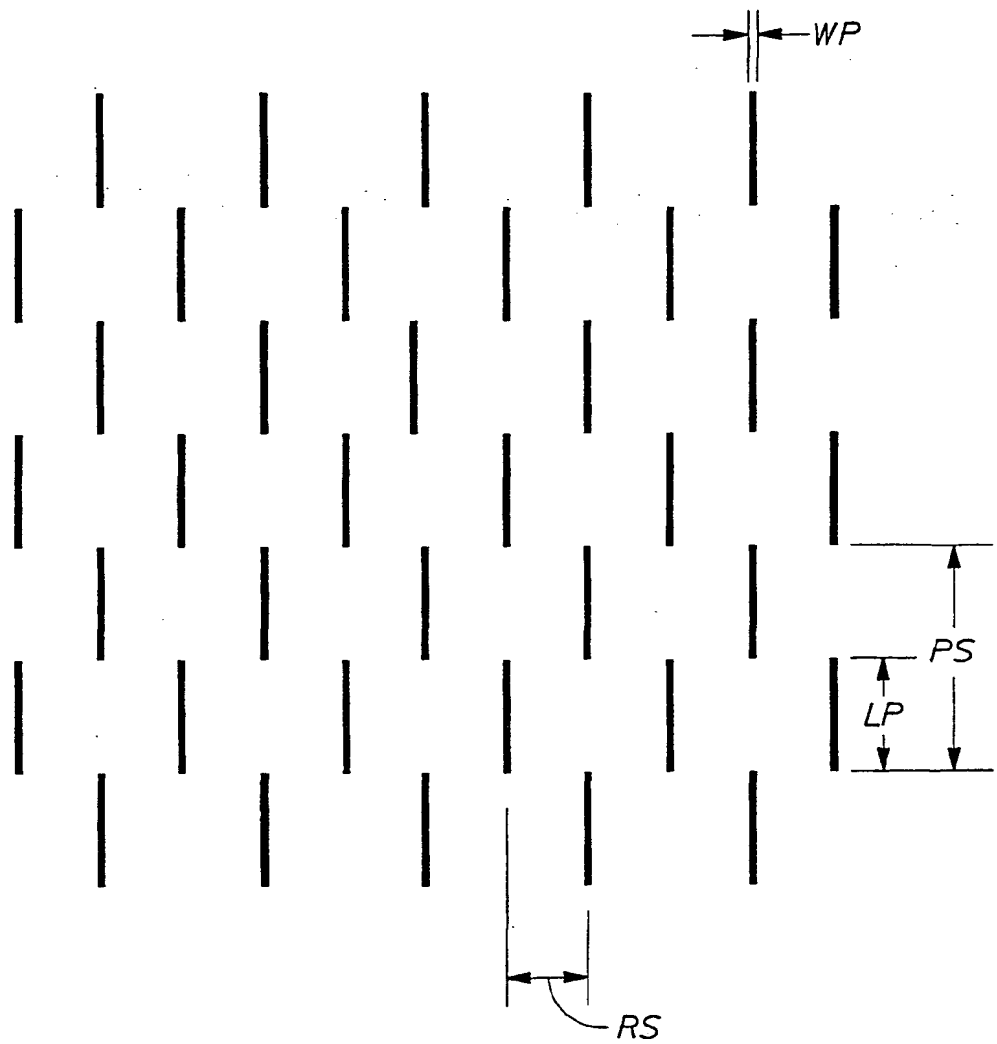


Fig. 11

8/10

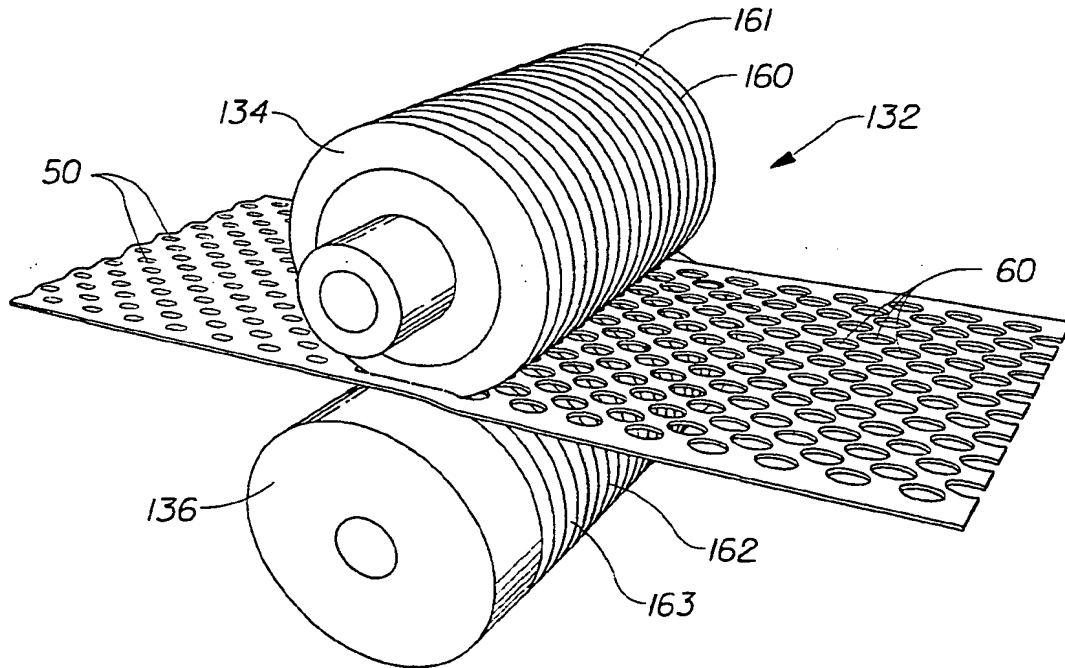


Fig. 12

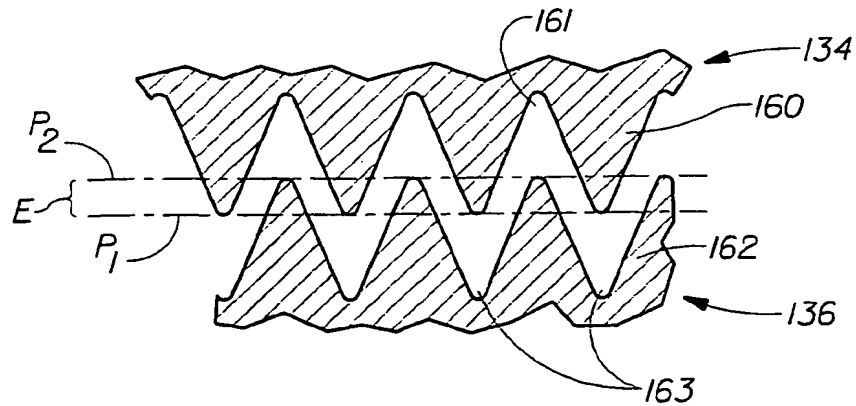


Fig. 13

9/10

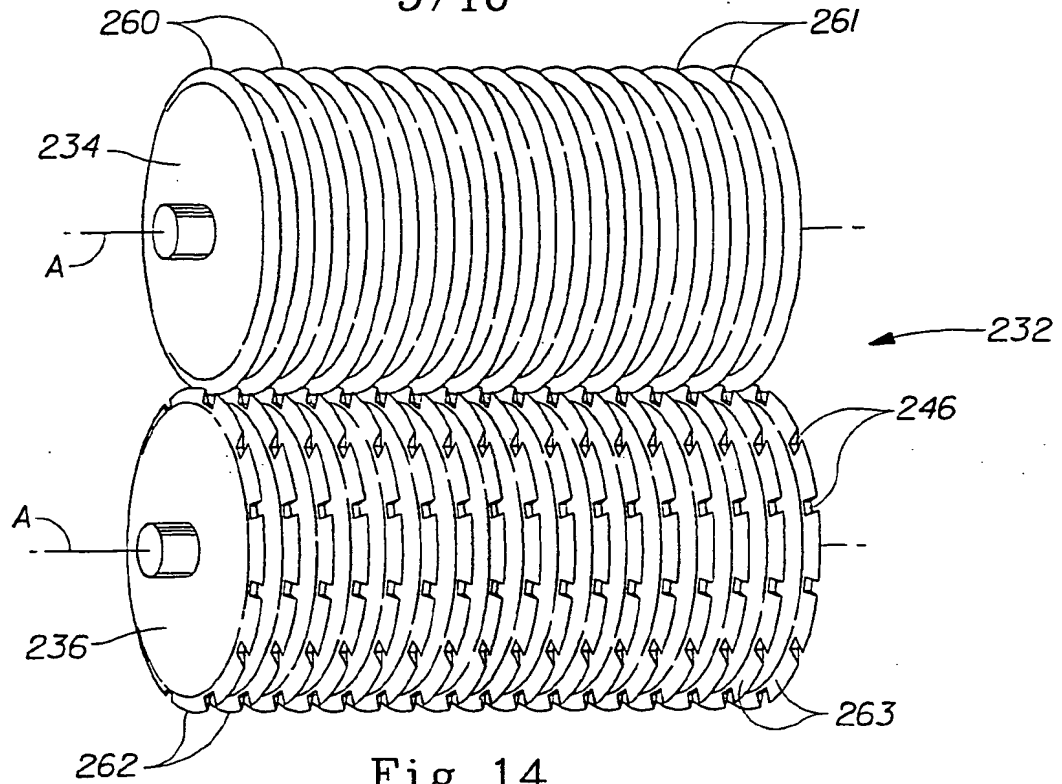


Fig. 14

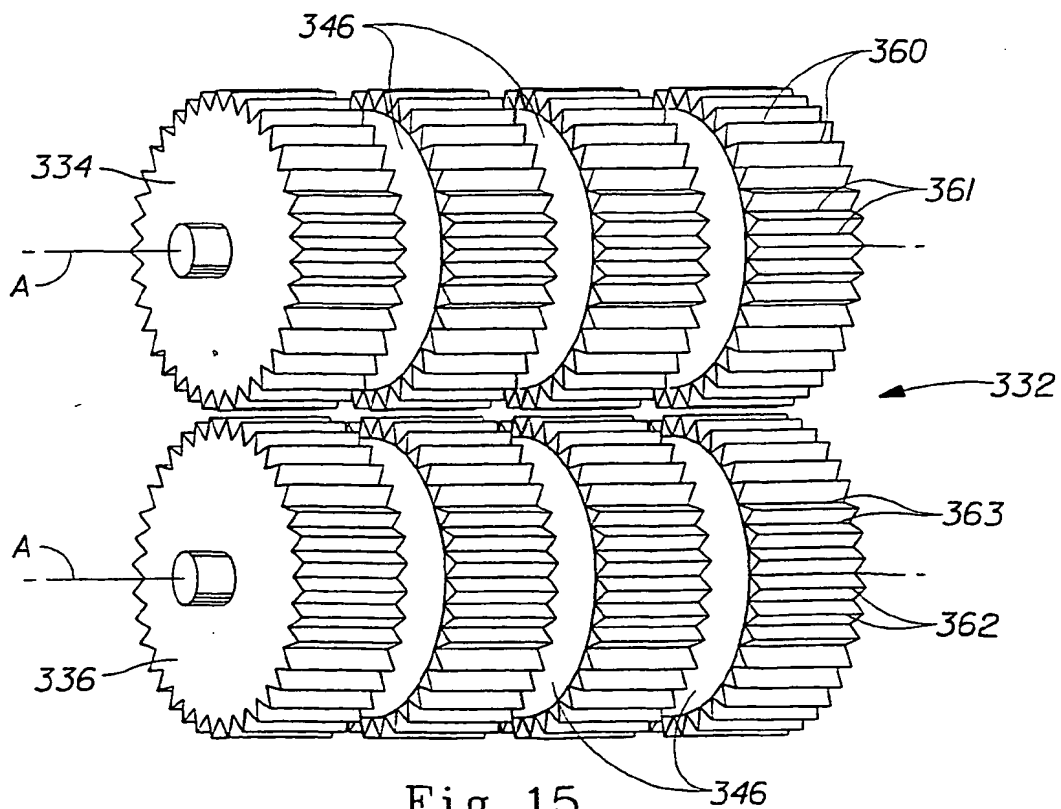
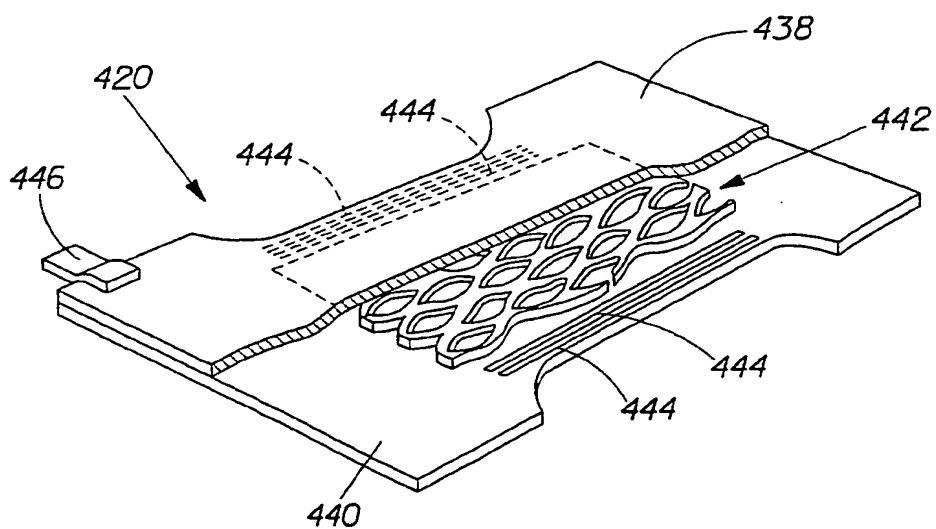
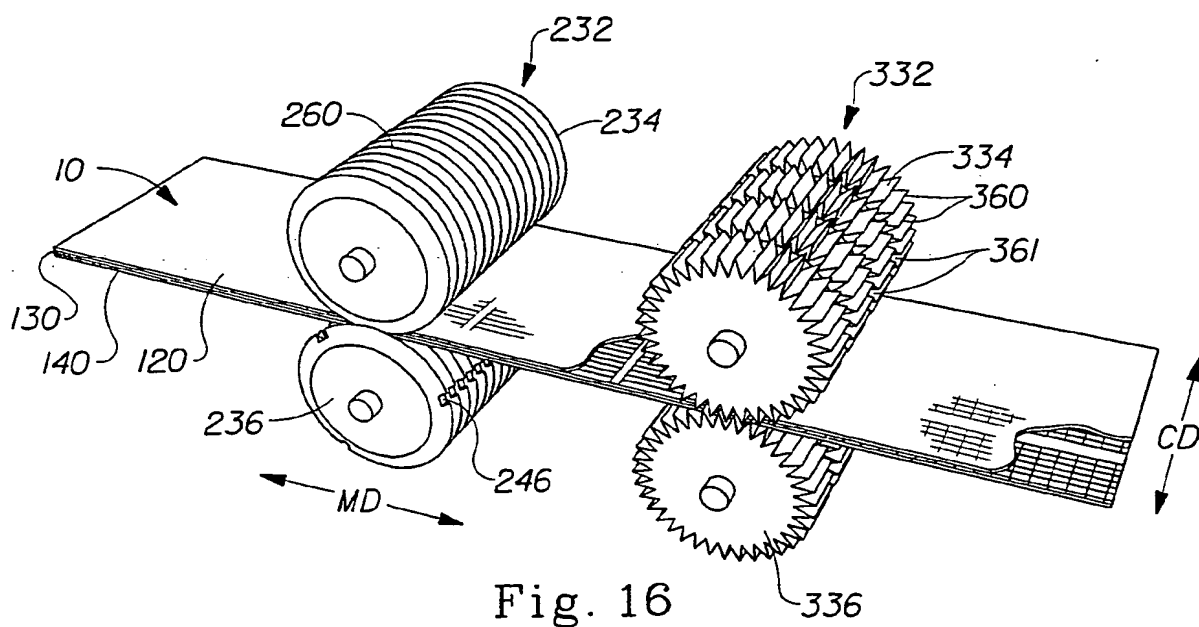


Fig. 15

10/10



## INTERNATIONAL SEARCH REPORT

Inventor's Application No  
PCT/US 00/34745

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A61F13/15 A47L13/17 A61K7/50 B32B3/24 B32B5/04  
B32B7/02 B32B27/06

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61K A61F B32B A61L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 797 310 A (BARBY DONALD ET AL) 10 January 1989 (1989-01-10) column 1, line 5 - line 14 column 14, line 15 - line 35; figure 3; example 53	1-8
X	US 4 603 069 A (HAQ ZIA ET AL) 29 July 1986 (1986-07-29) column 1, line 6 - line 17 column 5, line 12 - line 53	1-9
X	WO 99 25288 A (PROCTER & GAMBLE ; ROE DONALD CARROLL (US)) 27 May 1999 (1999-05-27) page 1, line 23 - line 30 page 3, line 22 - line 31 page 26, line 3 - line 31	1,2,8,9
	-/--	

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

## \* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- \*S\* document member of the same patent family

Date of the actual completion of the international search

21 March 2001

Date of mailing of the international search report

02/04/2001

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel: (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer:

Lindner, T

## INTERNATIONAL SEARCH REPORT

Int. Patent Application No.

PCT/US 00/34745

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 643 588 A (WARNER ALRICK VINCENT ET AL) 1 July 1997 (1997-07-01) column 2, line 5 - line 56 claims 1-24 ----	1,2,8,9
A	US 5 413 811 A (FITTING STEVEN W ET AL) 9 May 1995 (1995-05-09) examples 4-7 column 8, line 24 - line 34 claims 1-11 ----	1-8
X	WO 99 37476 A (PROCTER & GAMBLE) 29 July 1999 (1999-07-29) page 6, line 5 - line 28 page 10, line 20 - line 25 page 11, line 10 - line 17 page 14, line 1 - line 15 page 21, line 15 - line 20 ----	10
A	US 3 927 673 A (TAYLOR GLENN N) 23 December 1975 (1975-12-23) claims 1-7,12-18; figures 2,4 -----	10

# INTERNATIONAL SEARCH REPORT

Information on patent family members

In International Application No

PCT/US 00/34745

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4797310	A	10-01-1989	AT 17442 T	15-02-1986
			AU 554469 B	21-08-1986
			AU 8511682 A	13-01-1983
			BR 8203734 A	21-06-1983
			CA 1196620 A	12-11-1985
			DE 3268527 D	27-02-1986
			DK 287882 A,B,	27-12-1982
			EP 0068830 A	05-01-1983
			ES 276075 U	01-04-1984
			GR 77207 A	11-09-1984
			JP 1638061 C	31-01-1992
			JP 2055044 B	26-11-1990
			JP 58013638 A	26-01-1983
			NO 822123 A,B,	27-12-1982
			NZ 201037 A	11-04-1986
			PH 22138 A	01-06-1988
			PT 75126 A,B	01-07-1982
			ZA 8204501 A	25-01-1984
US 4603069	A	29-07-1986	AU 550659 B	27-03-1986
			AU 2162783 A	31-05-1984
			BR 8306445 A	26-06-1984
			EP 0112654 A	04-07-1984
			ES 275950 U	16-03-1984
			GB 2130965 A,B	13-06-1984
			GR 81291 A	11-12-1984
			JP 1026286 B	23-05-1989
			JP 1541348 C	31-01-1990
			JP 59108533 A	23-06-1984
			NO 834336 A	28-05-1984
			NZ 206331 A	09-05-1986
			PT 77746 A,B	01-12-1983
			ZA 8308712 A	31-07-1985
WO 9925288	A	27-05-1999	AU 2704599 A	07-06-1999
			BR 9714959 A	03-10-2000
			EP 1032336 A	06-09-2000
			ZA 9810368 A	14-05-1999
US 5643588	A	01-07-1997	AU 4135496 A	19-06-1996
			BR 9509774 A	04-11-1997
			CN 1168638 A	24-12-1997
			CZ 9701611 A	15-10-1997
			EP 0794804 A	17-09-1997
			FI 972237 A	27-05-1997
			HU 77662 A	28-07-1998
			JP 10509896 T	29-09-1998
			NO 972394 A	28-07-1997
			TR 960502 A	21-07-1996
			WO 9616682 A	06-06-1996
			US 6118041 A	12-09-2000
			US 5968025 A	19-10-1999
			US 6166285 A	26-12-2000
			US 6120488 A	19-09-2000
			ZA 9510061 A	18-06-1996
US 5413811	A	09-05-1995	CA 2126385 A	19-09-1995
			EP 0672777 A	20-09-1995

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 00/34745

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9937476 A	29-07-1999	AU 1887099 A EP 1045758 A	09-08-1999 25-10-2000
US 3927673 A	23-12-1975	AT 352044 B AT 623875 A AU 497380 B AU 8333075 A BE 832344 A BR 7504866 A CA 1029902 A CH 587619 A DE 2535058 A DK 363075 A,B, ES 226062 Y ES 227814 Y FR 2330339 A GB 1509229 A IE 41647 B IT 1041061 B JP 1324699 C JP 51044055 A JP 60042281 B MX 144519 A NL 7509514 A,B, PH 11726 A SE 400699 B SE 7508269 A ZA 7504668 A	27-08-1979 15-02-1979 14-12-1978 27-01-1977 01-12-1975 03-08-1976 25-04-1978 13-05-1977 26-02-1976 13-02-1976 01-12-1977 16-12-1977 03-06-1977 04-05-1978 27-02-1980 10-01-1980 27-06-1986 15-04-1976 21-09-1985 23-10-1981 16-02-1976 30-05-1978 10-04-1978 13-02-1976 23-02-1977